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EDITORIALS

MAKING THE ELECTRICAL STORE ATTRACTIVE.

The attention of the electrical contractor and dealer has often been directed to the necessity of proper window dressing and recognizing and following the principles of merchandising which have been demonstrated as applicable to other lines of business. It is generally appreciated that window displays, advertising and other points of contact with the purchaser must be fully utilized if the greatest volume of sales is to be achieved. It is not only necessary to attract the eye and the attention of the prospect who already has in mind the purchase of some electrical device or supplies, but the effort should be made to stimulate a desire in those who have not given the matter previous consideration.

In making such an appeal to the public, the electrical dealer should realize that he is in the larger sense in competition not only with other electrical firms, but with all others engaged in retail merchandising of any kind. In most communities there is a rather definite amount of resources applicable to the purchase of articles for household and personal use. The proportion in which such funds are expended in different lines of trade depends largely upon the appeal which is made by the latter to the individual in stimulating his desires, and in making the wares attractive. In this sense all retailers are in competition with each other, even though a certain amount of sales will have their nature determined by considerations entirely outside the control of the merchant. It is, however, often the margin of trade which can be influenced by proper sales and advertising methods which may determine the success or failure of a particular enterprise.

Merchandising is an art which deserves careful study by the electrical dealer along lines which have spelled success in other businesses.

DEVELOPMENTS IN TRANSFORMER CONSTRUCTION.

Reliability in operation is today recognized as the first requirement in transformer construction. Efficiency, first cost, regulation, etc., are important elements which must be fully considered in designing the mechanical and electrical features, but reliability cannot be sacrificed to any of these. Transformers are required which will not only operate under normal conditions, but which can withstand such abnormal conditons as short-circuit. General adaptability is also an important feature, and since many transformers are required for outdoor service, it is becoming general practice to fit all self-cooling transformers for such service. Self-cooling units are now available in sizes up to 5,000 kilowatts. With proper consideration to tank radiaton and construction to meet this end, there is no reason why this capacity should not be exceeded in future.

The advantage of circular coils in rigidity and strength is becoming more widely recognized. This form of coil is most easily applied in core-type construction and this type includes each year a greater proportion of the total output. Core-type transformers are now built up to 10,000 kilowatts in size.

The suitability of air-blast transformers for special locations keeps up the demand for this type of unit, and larger capacities have lately been realized in single units than ever before. During the past year a 10,000-kilowatt transformer of this type was constructed, a new record having thereby been set, as nothing so large as this had ever before been attempted in this type of construction.

BOILER-ROOM FACILITIES.

Steam engineers as a rule understand the conditions of boiler firing which are necessary to secure the highest efficiency in the use of fuel, that is, to secure complete combustion and at the same time extract from the products of combustion the greatest amount of the liberated heat. Many men have acquired sufficient judgment to decide fairly well from inspection whether the necessary conditions are being realized, and if not, what measures are necessary to do so, but to be sure of his ground even the most experienced engineer will resort to carbon-dioxide meters, steam-flow meters, etc., and will compare the figures for pounds of water pumped, pounds of coal consumed, steam pressure maintained, etc. In other words, only a quantitative knowledge of data and conditions is adequate for basing a definite opinion of performance and results achieved.

For the satisfactory and economical management of the boiler room, facilities should be supplied for making such definite quantitative checks at all times, and not merely upon the occasion of formal boiler tests. The average fireman is not a combustion expert, and his training has usually been along the line of keeping up steam pressure and seeing that the water level in the boiler does not get too low. Perhaps he has been instructed also to avoid smoke as far as possible, but in many cases he has no means of knowing whether smoke is actually issuing from the chimney. If the load is not such as to tax the capacity of the boiler he may have little or no indication of whether the fuel is being burned efficiently, whether a surplus of air is being admitted to the furnace, or whether other conditions are

wrong. To have intelligent firing carried out, the boiler room should be provided with proper facilities and the fireman should have instruction as to how they may be intelligently used in securing the best results.

FACTORY LIGHTING CODES.

The necessity for specific requirements as to the lighting of factories and other workshops is coming to be generally recognized. The factory laws of many countries and of some of the states in this country have made some general requirements as to adequate artificial lighting, but as a rule these have not been specific enough to accomplish anything definite. During the past year committees have been at work in both England and the United States formulating codes which give in some detail the desirable characteristics for a satisfactory system of lighting, including a few numerical values for fixing definite requirements.

The British report on this subject was prepared under the direction of the Departmental Committee on Lighting in Factories and Workshops. The American report was prepared by a committee of the Illuminating Engineering Society and was presented at the last annual convention of that Society. The two reports have some features in common and in some respects differ in their scope. Each report gives a discussion of the subject as well as providing definite recommendations as the basis for legislation.

In the general principles which are applicable and in the general requirements which are set forth, the two reports are in good agreement. Both recognize the necessity of avoiding glare and of supplying illumination of sufficient intensity and uniform in its distribution, and of providing for the illumination of vertical as well as horizontal planes of work. The necessity of cleaning reflectors and other equipment is pointed out.

When it came to specifying minimum requirements numerically, the British committee was not so ready to adopt values except for poorly illuminated places such as stairways. For the latter it prescribed 0.1 foot-candle as a minimum, whereas the American code specifies 0.25 foot-candle. For open yards the British minimum is placed at 0.05 foot-candle, whereas the American code does not give any specification for such places.

For rooms where rough manufacturing is carried on the American committee has specified 1.25 foot-candles as a minimum, and for fine work 3.5 foot-candles. The British committee has not attempted to give definite values for different kinds of work, but has satisfied itself by limiting the general illumination to a value not lower than 0.25 foot-candle, with the understanding that this is to be supplemented at places where work is being done. It should be noted in this connection, however, that the American specification is not a real minimum, since another specification in the code permits a 20-per-cent deterioration from the specified value. The specification consequently is not so exacting as would at first sight appear.

The proposed standards are not high in any case, and it is not intended to suggest that they are the most desirable values. The above values are lower than those which will be found in many well lighted factories. The aim has been rather to suggest a legal minimum which might without hardship be required in every case, thus improving the conditions in those factories which have not followed good practice, without running any risk of enforcing a requirement which might in some individual case entail a greater expenditure than is warranted in preventing unsafe conditions or such as may be deleterious to the eyesight of the workers. For it is upon the latter grounds that legal requirements are at all justifiable.

The fact that so much attention is being given to adequate illumination is encouraging to those who have for a long time recognized the need of improvements in this respect. In spite of the fact that it has been demonstrated that accidents are fewer in well lighted shops and that a superior quality and quantity of output results from the supply of adequate illumination, the deplorable fact remains that the majority of factories are not properly lighted and that one of the best investments their owners could make would be to install a new system of illumination. Legislation frequently appears to be necessary to drive the majority of managers of industrial plants as well as other persons to take measures for their own benefit and gain, and the domain of factory illumination is no exception to this rule.

FLOOD LIGHTING.

The tendency towards the use of flood lighting which has gradually taken form during the last few years was accentuated by the use of this form of illumination at the Panama-Pacific International Exposition. The electric lighting at the Exposition was a revelation to many of the possibilities along this line. The attention which it attracted was intensified by comparison with previous expositions, since upon no former occasion of this kind has the lighting been of a type which at all resembled that utilized at San Francisco.

A great stimulus was given by the notable effects secured at the Exposition to the utilization of flood lighting and during the past year the number of such installations, some of a permanent character and some for only temporary purposes, has been noticeable. Not only building facades, but billboards and other objects filling an advertising need, have been extensively illuminated after this fashion. One notable example of this style was furnished by the Chicago Christmas tree which was described and illustrated in last week's issue.

One of the main characteristics of flood lighting which especially commends it, is the absence of glare which is realized by making use of hidden sources of light. This presents a notable attainment from the standpoint of art and of personal comfort as well as

of good illumination. These are sufficient reasons for its popularity. It has, however, another merit, which consists in the flexibility which it offers for variation in the effects produced. The possibilities offered by changing colors, by shifting the high lights, and other manipulations which cannot easily be carried out with visible sources, may be easily achieved by this method.

The development of flood lighting is one which not only illuminating engineers, but purveyors of current and the general public may contemplate with satisfaction.

CURRENT RELATIONS FOR SUDDEN FUSING.

Values for the carrying capacity of wires and for the fusing currents which are ordinarily given in tables are based upon the supposition of a steady current or of one which is gradually raised to a fusing value. Under such conditions the temperature of the wire is determined by its ability to dissipate heat, and in all cases the heat generated in it is determined by the resistance and the value of the current flowing.

When a current has not a steady value, however, the instantaneous temperature which it may reach will depend not only upon its capacity for dissipating heat by radiation and convection, but also upon its heat capacity, or ability to absorb heat. The heat capacity depends upon the mass and the specific heat of the conductor. When comparing wires of different materials the specific heat may be slightly different. If the comparison is based upon equality of electrical resistance, the mass of metal involved will be quite different for the different substances. Iron, for instance, must have a considerable greater cross-section than copper in order to have the same resistance, and its heat capacity is consequently much greater. The specific heat of iron is not far different from that of copper. An aluminum wire having the same resistance as copper will have a larger cross-section, but a smaller mass. Aluminum, however, has a much higher specific heat than copper, so that the heat capacity of the wire will not be so greatly different.

The importance of these considerations was brought out in a paper read by Prof. Frank C. Wagner at the recent meeting of the American Association for the Advancement of Science. The investigation made by him was suggested by an accident case, and it developed that a copper wire having a larger carrying capacity than a given iron wire and requiring a larger steady current to fuse it, would nevertheless melt more quickly than the iron wire under an excessive overload. This is a fact which it is well to bear in mind in connection with ground wires and protective apparatus which is to operate under conditions of suddenly applied voltage or current, such as may arise from lightning discharges, etc. It will not do to assume in such cases that the conductors will behave the same in this connection under transient conditions as under steady conditions, any more than in other electrical relations.

MAKING UTILITY CUSTOMERS FINANCIAL PARTNERS.

It is generally agreed among central-station executives that activities looking toward the promotion of more harmonious relations between a public utility company and its customers are of great importance and that, although there may be differences of opinion as to the best means of fostering such harmony, some well defined program should be followed. Public-policy advertising in newspapers and through other mediums is perhaps the oldest and most satisfactory method of gaining the confidence of the community served. Quite recently the plan of inducing central-station customers to become financially interested in the company has been given considerable impetus.

The underlying feature of such propaganda has been to encourage as many as possible to invest small amounts either in stock or bonds of small denomination rather than solicit large investments from comparatively few. In most instances where this plan has been adopted the response on the part of the public has been most gratifying. Reports received from many sources have indicated that one direct result of having its customers financially interested in the company has been that fewer trivial complaints have been received. It seems to have been the attitude on the part of the investors that, being financially interested in the company, it was good policy on their part to overlook little omissions or trouble in connection with the service that otherwise would have been cause for a grievance.

Elsewhere in this issue there is published a brief preliminary report from a syndicate operating a number of public utilities where the plan of making customers financial partners has been widely adopted. Aside from business increases, which may in some measure be attributed to this policy, the company in question reports that it has every reason to expect that the widespread distribution of securities and earnings in home territory will practically do away with unfair agitation against progressively managed corporations.

The wise central-station operator is he who looks ahead. By encouraging customers to invest in their home utilities it is obvious that the company will be in a much more favorable position at a time when franchise renewal, rate adjustments, municipal ownership, etc., are up for consideration than if this commendable phase of public-policy activity were ignored.

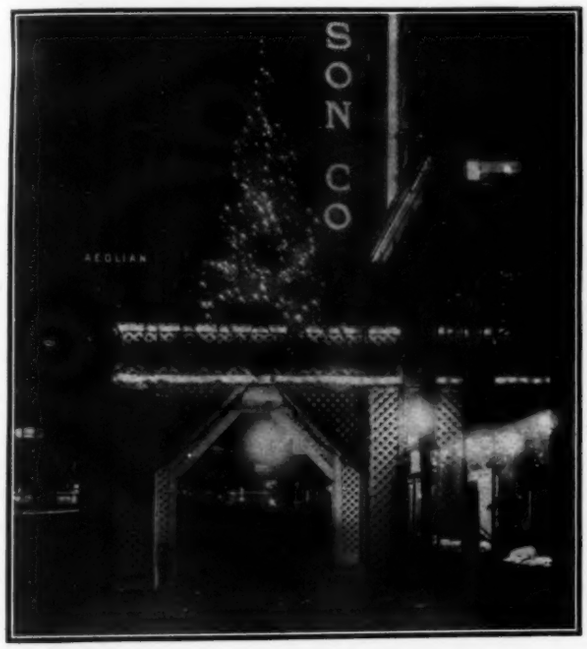
The form of participation may consist in the issuance of "baby" bonds in denominations such as to attract small savings, or stock of the usual par value may be offered either for cash or on the installment plan. In the latter case interest should be allowed on all payments from the time at which they are made, even though the delivery of certificates is deferred until the payments are completed.

Happenings in the Industry

Unique Christmas Tree in New York—Meeting of American Association for the Advancement of Science—New York Vehicle Matters—University of Illinois Receives Historical Gift—High-Pressure Distribution Systems Discussed—Big Attendance at Sandusky Show—Miscellaneous News Notes

An Over-Sidewalk Christmas Tree in New York.

The first Christmas tree to be erected over the heads of passersby nodded its topmost light more than 50 feet above the pavement of West Forty-second Street, New York City, on Christmas. The tree, which was a giant fir about 35 feet high, came from Canada. It was set on an ornamental platform fifteen feet above the sidewalk, in front of the 124 West Forty-second Street offices of the New York Edison Company. Nearly a thousand tiny electric bulbs decked the branches of the tree and the portico itself was outlined with concealed electric lights



Over-Sidewalk Christmas Tree in New York.

and Christmas greens. The idea originated with Arthur Williams, general commercial manager of the New York Edison Company and was carried out by the Engineering Bureau. The tree could be plainly seen for several blocks and was constantly the object of admiration of groups on the sidewalk. This is the first time that a Christmas tree has ever been placed in so unique a position.

Next Institute Meeting in New York.

The 317th meeting of the American Institute of Electrical Engineers will be held in the Engineering Societies Building, 33 West Thirty-ninth Street, New York City, on Friday, January 14, at 8:15 p. m.

Charles P. Steinmetz will be the speaker of the evening and will present a paper entitled "Outline of Theory of Impulse Current," in which he shows that from the integral of the general differential equation of the electric circuit, all types of electric currents are derived as special cases corresponding to particular values of the integration constants. In presenting this subject Dr. Steinmetz will supplement the printed paper by an explanation of the general subject as fully as the time will permit.

CARRYING CAPACITIES OF WIRES FOR TRANSIENT CURRENTS.

Meeting of the American Association for the Advancement of Science.

At the meeting of the American Association for the Advancement of Science, held at the Ohio State University, Columbus, O., December 27 to 31, 1915, a paper was presented by Frank C. Wagner, of Rose Polytechnic Institute, before the Engineering Section, entitled "Relative Carrying Capacity of Different Metals for Electric Currents Greater than Fusing Currents." Professor Wagner showed that the relative carrying capacities as given in the usual tables do not apply to heavy currents of magnitudes sufficient to melt the wire; that is to say the wire which will safely carry the largest steady current is not necessarily the one which will longest resist fusion when an excessively high current is transmitted.

Professor Wagner worked out an equation for the time necessary for fusion under different circumstances. The general equation of the form $t=KF^2/I^2$, where t is the time in seconds, I is the current in amperes, K is a constant, F is a quantity depending only upon the metal of which the wire is composed. F may be calculated for substances where the necessary properties, such as specific heat, conductivity, etc., are known. The following values have been verified by experiment:

For copper, $F=10.2\times10^3$.
For iron, $F=1.19\times10^3$.
For aluminum, $F=3.6\times10^3$.
For German silver, $F=1.7\times10^3$.

He cited a case where wires of iron and copper were compared. The copper wire required a current of 42 amperes to just fuse it, while the iron wire required only 25.8 amperes. When 108 amperes were sent through both wires the copper fused in 1.4 seconds, while the iron wire remained intact.

In many telephone installations where No. 12 iron wire has been used, it has been considered sufficient to make a ground connection with No. 18 copper wire. The latter will carry steadily a larger current than the former, but will fuse first with an abnormally large current. It is, therefore, not suitable for a ground connection.

The Engineering Section met under the chairmanship of Bion J. Arnold, of Chicago. Among other papers which were presented were the following: "A Cylinder Friction and Lubrication Apparatus," by Allan E. Flowers; "Automatic Mapper," by F. E. Austin; "The Engineering Laboratories of the Ohio State University," by William F. Maguruder.

Section B held joint sessions with the American Physical Society. Among the papers presented was the address of the retiring vice-president, Anthony Zeleny, entitled "The Dependance of Progress in Science Upon the Development of Instruments."

G. M. J. Mackay presented a paper by C. V. Ferguson and himself entitled "Arcs in Gases Between Non-consuming Electrodes." This described experiments in connection with such arcs as are utilized in lamps of the type described in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN December 25, 1915, page 1166.

The following papers were also presented: "A Proposed Physical Method for Reducing Radiant Power to Its Luminous Value," by Irwin G. Priest and Chauncy G. Peters; "A Luminosity Curve Equation and Its Application to the Black

Body," by E. F. Kingsbury; "Black-Body Brightness and the Mechanical Equivalent of Light," by Herbert E. Ives and E. F. Kingsbury; "The True Temperature Scale for Tungsten and Its Emissive Powers at Incandescent Temperatures," by A. G. Worthing; "Color Temperature Scales for Tungsten and Carbon," by Edward P. Hyde, F. E. Cady and W. E. Forsythe; "A New Law Relating Ionization Pressure and Current in the Corona of Constant Potentials," by Earle H. Warner; "The Hall Effect and Allied Phenomena in Rare Metals and Alloys," by Alpheus W. Smith; "A Resonance Method for Measuring the Phase Difference of Condensers," by H. L. Dodge; "A Simplified Apparatus for Measuring the Conductivity of Electrolytes," by R. P. Hibbard; "Measurements of an Electric Current from Its Heating Effect," by S. Leroy Brown; "A Study of the Law of Response of the Silicon Detector," by Louise S. McDowell; "Constant High Potential for X-Ray Work," by Albert Hull; "Carbon Compression Rheostats," by E. L. Clark; "The Black Body at the Melting Point of Platinum as a Fixed Point in Photometry," by Herbert E. Ives; "The Luminous Efficiency of the Carbon Incandescent Lamp and the Mechanical Equivalent of Light," by Herbert E. Ives and E. F. Kingsbury; "The Hall Effect and Allied Phenomena in Tellurium," by P. I. Wold.

New York Vehicle Meeting.

E. W. Curtis, Jr., of the General Vehicle Company, gave a very interesting talk on "Electric-Vehicle Conditions in Europe" at the meeting of the New York Section of the Electric Vehicle Association of America, held on December 28.

At the same meeting, S. C. Harris, storage-battery expert of the New York Edison Company, read a paper on "Methods of Design and Operation Which Assure Efficiency of the Electric Vehicle," advancing many new and novel ideas based on practical experience and thorough study of the electric-vehicle problem. This paper brought considerable discussion from many prominent engineers and proprietors of electric vehicles.

A special feature connected with the meeting of the Section was the exhibition of one of the electric taxicabs of the Detroit Taxicab Company. It was stated that 25 of the cabs have been in operation in Detroit for over a year with great satisfaction to the taxicab company, formerly large operators of the gasoline type, and that the Detroit public was keenly interested in the new development. Several engineers present, in close touch with the taxicab situation, predicted their general introduction in the larger cities of the country because these cars overcome the disadvantages of other types of taxicabs.

Cups to be Presented to Winners in Ward Electric Sales Campaign by Arthur Williams.

The New York Electric Vehicle Association has just announced the winners of the two silver cups offered by Arthur Williams for the best selling records in the recent two months' campaign of the Ward Motor Vehicle Company, in marketing its new 750-pound electric delivery wagon. The cups, which were offered to incite friendly competition among the salesmen of the various lighting companies, have been on exhibition during the past week in the New York Edison show rooms at Fifteenth Street and Irving Place.

The first cup, which is the team prize, was won by the New York team comprised of central-station salesmen of Greater New York. The New Jersey team came in second. The second cup, which is the individual prize, goes to Edward Friend, a salesman in the Harlem office of the New York Edison Company, for the greatest number of cars sold by one man. Henry S. Reilly and H. J. Gardnier received honorable mention.

Kansas City Christmas Tree Donated by Local Central Station.

Along with dozens of smaller towns in the West which were celebrating Christmas with "community trees," Kansas City, Mo., also celebrated, but in a way that made its festivities of considerably more than local significance. Its tree was in the Plaza at the Union Station, and the festivities were enjoyed by thousands of travelers, visitors to Kansas City, and persons waiting for trains. The tree was decorated and illuminated the day before Christmas, and was kept in place until after New Year's Day, during the period three distinct programs being given under the auspices of the Women's City League. The plan had the co-operation of the various musical societies, including the Third Regiment Band; and on one of the afternoons, hundreds of school children provided the entertainment.

The tree had been discovered in Union Cemetery, near the station, a forest fir nearly fifty feet high, and was moved to the Plaza by the Kansas City Electric Light

Kansas City Christmas Tree at Union Station Plaza.

Company. The company strung several hundred lights of many colors over the tree, with other decorations, and set a great American flag, in lights, nearby, on one of its poles. The area opposite the station, in the midst of which the tree was placed, is more than 200 feet wide; the station building rises about 100 feet from the street level, so that a large tree was necessary. On the top of it the company placed a star. The tree was illuminated every evening for more than a week, and thousands of citizens made special trips to the station to view it.

University of Illinois Secures Historical Generating Unit.

The College of Engineering of the University of Illinois is to receive from the Commonwealth Edison Company of Chicago, Ill., through the courtesy of its president, Samuel Insull, as a museum exhibit, a vertical triple-expansion engine with its direct-connected generators and their equipment of transformers, regulators, switches, instruments, etc.

Mr. Insull's letter of presentation sets forth the fact that this engine, which was one of ten similar units, has a normal rating of 600 horsepower and was built in the year 1893 by the Southwark Foundry & Machine Company, of Philadelphia, Pa. It was erected during the winter of 1893-94 in the power house of the then Chicago Edison Company. Direct-connected to the engine, one on each side, were two

200-kilowatt, 150-volt direct-current generators, built by the General Electric Company. The Chicago Edison Company later replaced these generators with the present double-current machines, which were among the first of this type of generators built. The unit was put into service on August 1, 1894.

Jovians Present Christmas Tree to Knoxville.

The Christmas tree arranged by the Jovian League of Knoxville, Tenn., aided in prolonging the Christmas celebration throughout the week, as the tree was not dismantled until after New Year's day. Each night the 1,500 lights which decorated the tree were switched on.

The Christmas Eve celebration was a successful one in all respects. The tree was presented to the city by the Rev. T. G. Broughton and was accepted by Commissioner Sam E. Hill, who paid a tribute to the Jovians. T. P. Self, of the Knoxville Railway & Light Company, Tribune of the League, was in charge of the arrangements. One of the features of the tree was the star, which went through a gradual brightening.

High Output for Commonwealth Edison Company.

On December 24, 1915, which was an unusually dark day, the output of the Commonwealth Edison Company reached 4,550,137 kilowatt-hours, the highest daily output in the history of the company. The maximum demand on that day was not correspondingly high, the record so far being reached on November 29.

An Unusual Parade of Electric Vehicles.

Mention was made in a previous issue of a parade of electric vehicles which was conducted by a purchaser of a fleet to celebrate the inauguration of electric delivery service and also as the culminating feature of a sales campaign which was based on the company's improved delivery service. The accompanying illustration shows the parade in progress. Over 90 electric trucks, loaded with 300 tons of coffee, paraded the business district of Chicago on December 22 led by a police escort and band. Considerable attention was attracted and liberal newspaper space was given the affair, resulting in much favorable publicity.

High-Pressure Distribution Systems.

At the December meetings of a number of the sections of the Institution of Electrical Engineers, in London and the English provinces, the subject of the design of high-pressure distribution systems has been discussed. J. R. Beard introduced the matter in a paper in which he first emphasized the importance of safety in operation, suitability of supply for its particular purposes, and freedom from interruption. These he described as the essential characteristics which must be secured at a minimum total annual cost by a well designed distribution system.

With high pressures, accidents are frequently fatal, so safety in operation is of primary importance. The other two limitations have a commercial basis. In all its various uses, electricity is a competitor with other forms of energy, many of them very firmly established, and if it is not supplied in suitable form, or if the supply is subject to interruption, the sale of it will be restricted. The cost of power is such a small proportion of the total cost of running a factory that material irregularity in the supply quickly involves more loss than the whole cost of the power. In such circumstances a supply of electricity will not be a paying proposition, even if it can be obtained for nothing. Failure of supply is usually caused by the breakdown of apparatus, and the primary precaution is therefore careful attention to the design, manufacture and maintenance of the various parts of the system; but since no apparatus can be made absolutely immune from breakdown through external damage, the secondary precaution is to make arrangements so that the effects of a breakdown to any part of the system are localized as much as possible.

In some cases such precautions may mean increased capital cost, but they undoubtedly result in a net economy if a broad view is taken. Fortunately, however, well designed apparatus does not necessarily cost more than badly designed apparatus, and, as Mr. Beard showed, it is possible to cheapen the system by closer localization of breakdowns.

The chief items making up the annual cost are interest on capital expenditure, repairs and provision for depreciation, switchgear attendance, and energy losses in the mains. The sum total of these should be a minimum. The author considered them all in turn, noting in what ways they are interdependent and how they are affected by the essential characteristics noted above. The essential characteristics of the system are not incompatible with designing it on the

A Parade of Walker Electrics Conducted by a Chicago Grocer. There were 90 in Line.

basis of minimum annual cost, since though they may in a few cases increase the capital expenditure, this is discounted by savings in other ways.

Mr. Beard's object in his paper was to indicate, on the basis of the principles stated above, the most suitable choice of apparatus and the means whereby that apparatus could be used to the greatest advantage. Mains and switchgear form the important points in the choice of individual apparatus, and the methods by which such apparatus can be most economically utilized were considered in three natural successive stages. The basis of the investigations was: (*a*) The determination of the economical section of mains; that is, the correct balance between losses and capital expenditure. From this it was possible to consider progressively: (*b*) The layout of the distribution system to give the maximum economy; (*c*) the most suitable distribution voltage.

In the part of his paper relating to mains, Mr. Beard briefly considered the conditions which determined whether underground or overhead mains are most suitable for particular cases. His remarks concerning switchgear were directed to the more important or novel features which should influence the choice of the most suitable apparatus for substation use; similar principles apply, but with greater force, to power-station switchgear.

In regard to the economical section of mains, he said that although it is generally known that the economical cross-section of a main is that at which the sum of the annual charges and the value of the energy lost are a minimum, it is seldom that any practical use was made of the formula. This is partly owing to the difficulty of calculating the losses and of placing the correct value upon them when calculated, and also partly because there is an impression that the resulting cross-section would work out to a figure inconsistent with that required by considerations of carrying-capacity and voltage drop. In Mr. Beard's investigation he made an attempt to apply the formula to the special case of high-pressure distribution systems and this seemed to show that for this case at any rate the results are commercially useful.

In considering the layout of the distribution system, Mr. Beard said that, except in special circumstances, it is usually essential for each substation to have at least two separate sources of supply, and if the supply to the substation is not to be interrupted by a failure of one source, some form of discriminating protective device must be installed on each feeder in order to isolate it automatically in the event of its breakdown. It is, however, not so generally recognized that it is of equal importance that a fault on one feeder must not interfere with the supply through the sound feeders, however severe the fault may be. The only forms of protection in commercial use which meet these conditions under all circumstances are the balanced-current protective system with pilot wires, and the split-conductor protective system. Both have the further advantage that the isolation of the faulty feeder is practically instantaneous and can be effected with quite a low value of the fault current, so that the disturbance to the general system is a minimum.

Mr. Wedmore, in an earlier paper read before the Institution, recommended the split-conductor system as the more suitable for feeder protection. Mr. Beard said it was probable that one or other of them would be universally used if it were not that there is often an impression that they involve extra capital cost which is not justified by the extra security that they give. Undoubtedly they increase the cost per mile of a main of given section, but this is counterbalanced by the saving effected by the possibility of using an interconnected system, which allows (*a*) a reduction in the cost of mains, due to the saving in spare feeders; (*b*) a reduction in the cost of mains, due to the possibility of replacing a number of small feeders by a few large ones which are cheaper per ampere of carrying capacity; (*c*) a reduction in the amount of switchgear required; (*d*) a reduction in the total annual cost of mains, owing to it being possible to take advantage of the diversity between the demands of different substations.

Mr. Beard, by means of a diagram of the high-pressure distribution system on the northeast coast of England, illustrated the extent to which a system might be safely interconnected by the use of these devices. No fewer than 350 substations are connected to this system, and it is fed by 15 power stations, many of which utilize waste energy in the form of exhaust steam and coke-oven gas. The whole of the feeders shown are normally in commission and interconnected, the older ones being equipped with balanced-current protection and the more recent ones with split-conductor protection.

As showing the reliability of both these forms of protection, the operating records of this system indicate that over a period of time, selected quite at random, faults occurred on 23 feeders equipped with automatic protection, and that in 22 cases the faulty feeder was instantaneously isolated without causing an interruption of supply to a single substation, except in one instance where the substation in question was given a non-duplicate supply through the faulty feeder. In the remaining case, although the protective gear operated satisfactorily, one of the feeder switches failed to open, due to a mechanical fault; this was equivalent to a busbar fault and brought out the overload gear at two sectioning points, thus limiting the trouble to this section of the system.

Mr. Beard attempted, in a full investigation that followed, to give definite figures for the saving effected by an interconnected system. These figures showed that the saving was not only sufficient to balance the cost of the protective devices, but that a system so equipped was actually cheaper than systems protected by less efficient methods which did not give the same freedom from interruption of supply.

Over 70 Per Cent of Population of Sandusky Visits Electric Show.

Nearly 16,000 people, or over 70 per cent of the population of Sandusky, Ohio, visited the electrical show given during Electrical Prosperity Week, and this under rather discouraging weather conditions. Every merchant in the city who deals in any kind of electric appliances, all of the contractors, and the Sandusky Gas & Electric Company, had exhibits, many of them unique and all educational in character. One of the interesting exhibits was that of the telephone companies, with switchboards in operation and operators present to explain the little things about telephony that people most frequently misunderstand.

The proceedings were opened December 1 with a "pilgrimage" to Milan, Ohio, by over 150 business men, where a tablet was attached to the house in which Thomas A. Edison was born. This trip was made, in a rain and sleet storm, in special interurban cars. It marked the beginning of a movement to erect a monument to Mr. Edison at the place of his birth, which movement is now in process of organization.

The ceremonies at the Edison homestead were in charge of Major C. B. Wilcox, of the Sandusky Gas & Electric Company, a W. S. Barstow & Company property, and the principal address was delivered by James T. Bagg, superintendent of the schools of Sandusky. Mr. Edison sent the following telegram to the committee: "Your telegram has been received and I desire to express to you and to all concerned my deep appreciation of the honor that has been conferred upon me by yourselves and the people of Sandusky."

National Electric Light Convention to Open in Chicago on May 22.

As mentioned in our issue of November 27, the thirty-ninth annual convention of the National Electric Light Association will be held at Chicago, Ill., during the week of May 22. An earlier date than usual was selected by President Lloyd because of the National Republican convention, which will be held in Chicago early in June.

Headquarters will be at the Congress and Auditorium Hotels, where it is proposed all the meetings shall be held, as well as the annual exhibit.

Electric Cooking Discussed Before Kansas City Jovians.

Louis H. Egan, general manager of the Kansas City (Mo.) Electric Light Company, delivered an address Tuesday, December 28, before the Jovian Electric Club, at Kansas City, on "Electric Cooking," illustrated with lantern slides prepared under his direction. The address had for its purpose the presentation of the problem involved in the establishment of rates for current for ranges. The slides showed, chiefly, cooking load curves from other cities, east and west, in some cases the curves being superimposed on the Kansas City residence load curves to show the probable effect of cooking loads on the local curves. The study of the experiences of central stations that have extensively promoted the installation of electric ranges was presented as suggestive of the obstacles and problems that would be encountered, as well as the advantageous features, in working out the arrangements for cooking loads and the exploitation of electricity for cooking, elsewhere. He mentioned, for instance, that in Kansas City, the cooking load would probably come at the time of the highest lighting load, in the evening, and the question would arise as to the relations between the cooking load-factor and the residence load-factor, the possibility being presented that, in fact, the cooking rate might be found not far from the residence rate, though various factors might influence the establishment of a lower rate than the operating figures justified.

The address was particularly timely, in view of the agitation that has been begun locally, for reduction of rates for current, particularly for cooking, with which is an incipient campaign for the building of a municipal plant.

There was some discussion following the address, during which it was mentioned that in fact a rate for electricity of three-tenths or four-tenths of a cent, would be necessary to compete, in fuel cost, with natural gas at 27 cents; and that it would be bad business, as well as violative of economic laws, to try to press the installation of electric ranges where an abundant supply of natural gas was cheaply available, except in cases where the many advantages of electricity as fuel, and other conditions, overcame the discrepancy in cost.

Safety Medal Winners Announced by American Museum of Safety.

Winners of the medals awarded by the American Museum of Safety for meritorious work in safety and conserving life have just been announced by Arthur Williams, president of the Museum. The Louis Livingston Seaman Medal for progress and achievement in the promotion of hygiene and the mitigation of occupational disease is awarded to William Armstrong Fairburn, president of the Diamond Match Company. This medal was awarded last year to Surgeon General William C. Gorgas, U. S. A.

The Scientific American Medal for the most efficient safety device is awarded to Elmer A. Sperry for his gyroscope compass. The Travelers' Insurance Company's Medal this year is awarded to the Hudson & Manhattan Railroad Company for achievement in accident prevention to its own employees and to the public. Dr. William H. Tolman, director of the Safety Museum, announces that the medals will be presented to the winners at the annual dinner of the Museum at the Waldorf Astoria on February 3.

Wireless to Japan.

The Japanese Government has notified the Marconi Wireless Telegraph Company of America that the new wireless station at Funabashi, near Tokio, is completed and will be ready for transpacific communication soon. Experimental work between Honolulu and Funabashi is now going on, and the reports indicate that the system is working in splendid fashion at both terminals, which are separated by a distance of 3,400 miles. The Funabashi station is equipped with the Marconi apparatus, but is owned and operated by the Japanese Government.

The new government station at Funabashi is a 300-kilowatt plant, the same as the plant near San Francisco. There are two stations at Honolulu, each of 300 kilowatts, one facing east and the other west, one to send and the other to receive in the relay work either way.

It was said that when the new transpacific service between Hawaii and Japan is opened to commercial business, the rates will be considerably lower than at present.

Book Review.

"The Electrical Blue Book." Chicago: Electrical Review Publishing Company, Inc. Cloth, 256 pages (7¼ x 10¼ inches). Supplied by publisher for $2.00.

The seventh edition of the Electrical Blue Book presents itself in a very practical and useful form, the new size adapting it for convenient filing with the business literature of the buyer of electrical material. Lighter paper is used and the volume is compact notwithstanding the comprehensive treatment of the subjects included in the work. Publication has been delayed until complete analysis and correction of changes in the National Electrical Code could be incorporated, so that this section of the Blue Book might conform to the most recent publications of the Code under the direction of the National Fire Protection Association. The underlying feature of the Blue Book is the presentation of the National Electrical Code, with illustrations and explanatory notes. Changes in the Code are made conspicuous through the use of bold-face type; there are 180 paragraphs of explanatory notes, and 79 half-tone and line illustrations showing approved methods of meeting Code requirements in electrical construction and installation. The user of electrical material having made certain of the conditions under which electrical equipment may be installed may turn to the List of Approved Fittings for a complete schedule of approved material available, and, having recorded this information may then visualize the material in the condensed catalog data presented by the manufacturers of electrical material. This co-ordinated service—the Code, illustrated and explained; the List of Approved Fittings, and the Condensed Catalog Exhibits of Manufacturers of Electrical Material, make the Electrical Blue Book a valuable adjunct to the working material of the engineer, contractor, architect or purchasing agent of the industrial corporation. In addition to the contents outlined above there are "Rules for Resuscitation from Electric Shock," "Code of Professional Conduct of the American Institute of Electrical Engineers," "Ground Detectors," and "Street-Lighting Schedule for 1916.

A Review of the Year.—Activities in the electrical industry during the year 1915 were reviewed by A. A. Gray, general manager of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, before the regular meeting of the Electric Club-Jovian League, of Chicago, on December 30.

Electricity in Brick Manufacturing Plants

A Description of the Process Involved In Brick-Making In a Territory Where Fuel Oil Is Plentiful But Where Central-Station Service Has Been Widely Adopted—Operating Data Are Given

Industrial Power Series—Article No. 149.

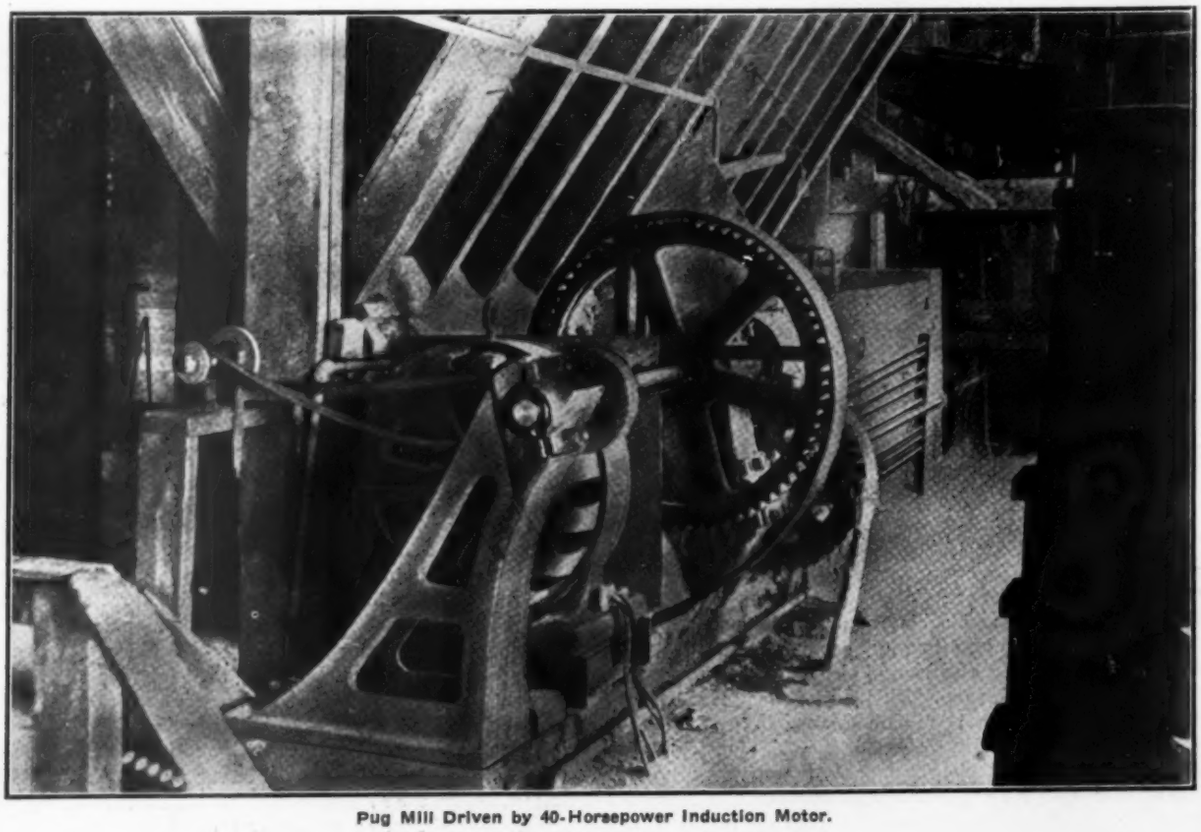
Very little development has taken place in the Southwest in the manufacture of dry-pressed brick and with few exceptions the same methods are employed today that were in use ten and fifteen years ago. Applications of new methods of manufacture have hence been difficult to start and the natural tendency to stick to the old method has been a hindrance to the adoption of electric drive.

Red, dry-pressed brick are made from a clay or shale which appears in various parts of the country in considerable quantities. This shale is found a few feet below the surface of the ground. The first factor to be considered in the location of a brick plant is the depth of the shale strata as all the top dirt must be removed before suitable raw product is procured.

The clay pit, as it is called in the ordinary brick plant, covers an acre or more of ground and is sometimes as much as 50 feet deep. The top dirt having been removed, the pit is gradually formed, the clay being used gradually for making brick. Care is taken to work the surface evenly as drainage is thus facilitated and bad weather is less likely to interfere with the operation of the plant if the pit is properly drained. Usually the pit is worked from one side to another so that at all times one side will be lower than the other or else it is worked so that a certain point is always lowest. The latter is the more usual method and when this system is used an ordinary steam or centrifugal pump is placed near this point and the water is pumped out as fast as the rains fill it up. In this way clay can be taken from the pit within a very few days after the most soaking rain.

Usually the hard shale is plowed and allowed to stand a few days before being carried into a storage shed. This serves to pulverize or slake it and it is much more easily ground. In the Southwest the storage shed is built to hold a large enough supply for one month's use. Here the clay is evenly distributed and left to be further dried out.

From the storage shed the clay is fed into what is known as a dry pan. This dry pan has a bottom made of heavy iron screen with rectangular openings. Two large, massive rollers which move in a direction opposite that in which the dry pan rotates crush the clay or shale through the openings in the bottom into a square pit where it is carried by means of bucket elevators up and over a series of screens in the loft above. The fine material is separated here and fed into a cylindrical mixer which mixes the large and fine particles together assuring an even texture in the finished brick. The powdered mass is then fed through a large rubber hose into the press boxes where as the press wheel revolves it is subjected to a pressure of over a ton to the square inch. As the brick come from the press they are placed on a long carrier and conveyed into the kiln where they are set ready for burning. Before being burned the brick are thoroughly dried out by means of slow wood fires, this process taking from 10 to 14 days, depending on the nature of the weather. When the drying process has been completed oil fires are started in arches on each side of the kiln and the fire gradually raised until the brick have reached a temperature of about 1,700 degrees Fahrenheit. The fires are then cut out and the openings sealed up and the brick



Pug Mill Driven by 40-Horsepower Induction Motor.

allowed to cool gradually. In about a week or ten days a part of one end of the kiln is removed and the brick are loaded onto cars by means of gravity conveyors. It takes a little over a month from the time the clay is removed from the pit until it is placed in cars for shipment.

Three Stages in Manufacture.

There are three distinct stages in the manufacture of dry-pressed brick and these three stages can be still further subdivided. The three divisions are made, however, because they are practically independent of each other as far as application of electric power is concerned and any one of the stages can be operated with the balance of the plant idle.

(1) Removing clay from pit and putting it in storage.

(2) Taking clay from storage and putting it through machinery which transforms it into brick, the brick being placed in the kiln.

(3) Burning process or time occupied in converting green brick into the finished product.

There are at present three general methods of conducting the first process, one method of conducting the second process, and three methods of conducting the last-named stage.

In the territory served by the Texas Power & Light Company one plant plows the shale pit and removes the clay by means of mule-team and scraper directly into the storage shed.

Motor-Driven Hoist Which Operates Clay Scraper.

Other plants use the plow and remove the clay in scrapers to a central point in the pit where it is dumped into a car which hauls it into the shed. Two plants are using a mechanical scraper to dig up the clay, one of these dragging it to a central part of the pit and hauling it into the storage shed in a car and the other taking the clay directly into the shed by means of the scraper. While the latter method is probably a little cheaper as far as labor is concerned, there is no doubt that the cost of maintenance and repairs on the equipment used in conveying the clay directly into the shed eats a large hole in the saving thus effected. The two methods are probably on a par as far as economy is concerned.

It is an easy matter to adapt electric drive to either of the latter two methods. At one plant the mechanical scraper is now being driven by a 50-horsepower, variable-speed, three-phase, induction motor which is connected to the hoist drums by means of a silent chain. This is effective, quick and efficient. No trouble has been experienced with this installation. From the central-station standpoint, however the load is irregular and not steady. On a moderately large system though this variation would prove negligible. A separate motor is used to drive the drum which operates the clay car. A 10, 15 or 20-horsepower squirrel-cage motor, the size depending on the incline and the speed desired, makes an admirable drive for this part of the equipment. Here is one place where electric drive is very advantageous, since it is often desired to operate this part of the plant without operating the main machinery and unless electric drive is used it is necessary to operate the boiler plant at a greatly reduced load in order to provide steam

Arrangement of Air and Oil Piping and Burners.

for the small engine with which these cars are usually operated in steam-driven plants. Then too in cold weather, since this small engine is of necessity a considerable distance from the main plant, a large amount of the steam condenses in the pipe line causing further loss.

Motor Drive for Brick Machinery.

Practically all of the plants are using the same method for the second stage of the process. A mule-team with light scraper is used to feed each dry pan. It takes from one to two minutes for the driver to make a trip and hence the pans are alternately crowded and empty. This causes an uneven load and consequently loss in production and efficiency. Various attempts have been made to interest these manufacturers in conveying machinery for this part of the plant but with no success as yet. With the proper conveying equipment one man could do the work that now required two men and two teams. This would effect a considerable saving, even after allowance had been made for power for the conveyors and interest and depreciation of equipment. Then too a more uniform load could be obtained with an improvement in efficiency.

Standard squirrel-cage motors are readily adaptable to the driving of crushing and pressing machinery. Most of the plants are two-press plants, each having a capacity of 20,000 bricks per day. It is very seldom that these are operated separately, although there are occasional shutdowns of one side of the plant. For this reason and on account of the variation of load due to weather conditions one motor will prove more efficient than two in this part of the plant. A 100-horsepower motor will furnish ample power for two presses, two dry pans and the necessary elevators. This machinery runs at constant speed and the load is fairly constant throughout the entire day. The load will vary somewhat during the different seasons of the year due to moisture in the clay. This makes a noticeable difference in the power consumption and also makes a difference in the fuel required to burn the brick.

It is necessary to heat the press boxes and dies in order to keep the clay from sticking and this small item has proven of considerable importance in the application of electricity to this business. Several electric heating units were tried out at

Motor-Driven Oil Pump for Furnishing Burners.

Data Sheet—Brick Manufacturing.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for twenty-four hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Plant A.

Plant "A" has a capacity of 40,000 dry-pressed brick per day of approximately 10 hours. Number of men employed, 18.

Operating hours per month, 260.

Total number of motors installed, 4.

Total horsepower, 124.

Average production per month when running full time, 1,000,000 brick.

Average kilowatt-hours per thousand brick for running machinery, pumping water and oil, and supplying air for burning, 20.

Load-factor, 20 per cent.

Consumption by months:

Month.	Kilowatt-Hours.	Month.	Kilowatt-Hours.	Month.	Kilowatt-Hours.
January	.....	May	10,900	September	8,600
February	13,000	June	11,200	October	.....
March	14,100	July	14,565	November	.....
April	17,600	August	14,100	December	20,000

MOTOR INSTALLATION.

Following is a list of motors installed with the machines driven:

No.	Horse-power.	Speed, R. P. M.	Application.
1	100	900	Belted to line shaft, driving two Boyd mold presses; two Eagle Iron Works dry pans; two strings bucket elevators; two mixers.
1	20	3,600	Direct-connected to centrifugal blower, capacity 1,650 cubic feet of free air compressed per minute to two pounds pressure.
1	3	1,800	Direct-connected to centrifugal pump for pumping water from pit.
1	1	1,200	Geared to rotary oil pump.

Plant B.

Plant "B" has a capacity of 40,000 dry pressed brick per day of approximately 10 hours. Number of men employed, 16.

Operating hours per month, 260.

Total number of motors installed, 4.

Total horsepower, 170.

Average production per month when running full time, 1,000,000 brick.

Average kilowatt-hours per thousand brick for running all machinery and operating clay hoist and drag, 18.

Load-factor, 15 per cent.

Consumption by months:

Month.	Kilowatt-Hours.	Month.	Kilowatt-Hours.	Month.	Kilowatt-Hours.
January	.....	May	11,310	September	.....
February	.....	June	18,960	October	.....
March	13,909	July	14,820	November	.....
April	15,640	August	8,090	December	.....

MOTOR INSTALLATION.

Following is a list of motors installed with the machines driven:

No.	Horse-power.	Speed, R. P. M.	Application.
2	50	900	Each belted to line shaft driving one Berg four-mold brick press; one Raymond dry pan; one string of bucket elevators.
1	50	720	Drives by means of silent chain hoisting machine to which is connected a scraper for digging clay from pit.
1		1,200	Belted to drum hoist which operates clay car in storage shed.

Centrifugal Blower for Atomizing Oil Supply.

one plant but the moisture in the clay is so great and the exposed surface of the die plates and press boxes so small that a heating unit could not be obtained which would do the work at a low enough cost. For this reason a small upright boiler was obtained for this purpose. This has been used successfully and requires practically no attention at all since oil is used as fuel.

The bricks are taken from the presses by the pressman who loads up a two-wheeled carrier. This carrier is wheeled into the kiln by hand. Here is a place where conveyors might again be used but as labor is comparatively cheap it is doubtful whether any saving would be effected by using mechanical conveyors. The physical nature of the plant would necessarily require a large amount of equipment which would have to be moved from kiln to kiln. This matter has never been pushed.

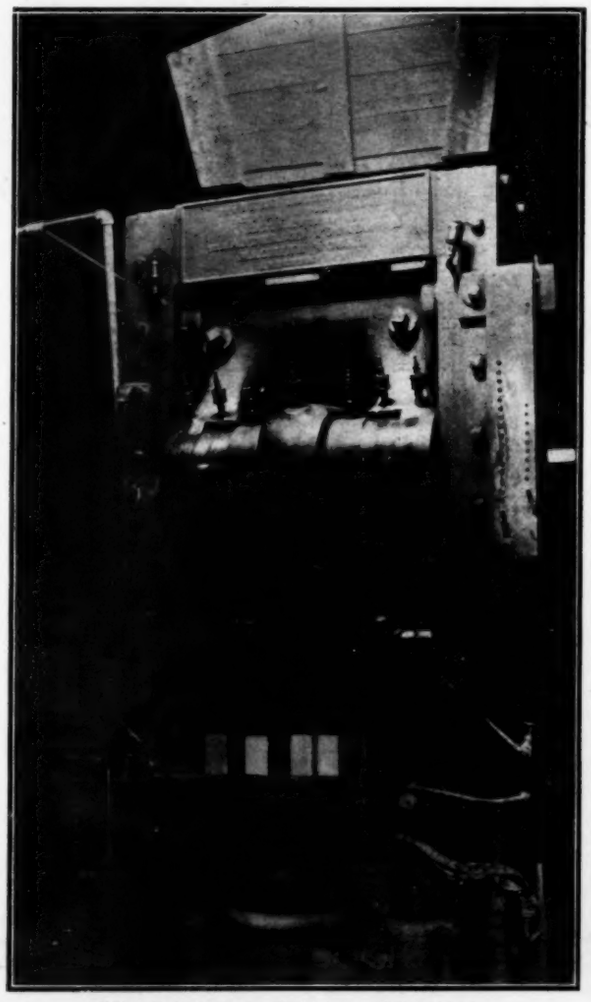
Brick Burning.

We next come to the burning process which has so far proved a big stumbling block in getting this business. The manufacturers keep all their records of fuel cost together and few of them have any data as to what portion of the fuel bill should be charged to their machinery and what part to their burning. The same boiler is used to furnish steam to the engine and to furnish steam for atomizing the oil used in burning. Hence the owners maintain that there is no saving on equipment and also maintain that there is a loss (provided they use their same equipment) due to running their boiler at a reduced load. This is true in part but nevertheless there is a certain part of the expense chargeable to the power plant proper and an analysis of this phase of the problem shows that electric drive can be employed in the operation of the machinery and steam used in the burning process with a considerable saving.

Nevertheless in order to follow the line of least resistance in obtaining this business investigations were made of other methods of burning. Natural gas is now being used in some of the plants and where this is being done this question has been eliminated. The only other method found was an old one and experiments were at once started. An air compressor was obtained and experiments made to determine the probable size of machine necessary for a plant of this size. The experiments started with a pressure of 100 pounds of air to the square inch, but it was quickly decided that this was not feasible as too large a capacity was required to make the matter successful commercially. After experimenting with various pressures it was decided that volume rather than pressure was what was needed. Accordingly tests were made with a number of patented low-pressure oil burners and one was finally chosen which it was thought would do the work.

A large motor-driven blower furnishing air at two pounds pressure was secured. A 10-inch galvanized header was run from this blower along the end of the six kilns and tees were placed at each kiln, six-inch opening being made. From these tees a lateral six-inch spiral rivetted pipe was run along the entire length of the kiln. There are 21 eyes on each side of these kilns and it was necessary to provide taps on the six-inch pipe for 21 one-inch pipes. Air was fed to the burners through these one-inch pipes and it was found that plenty of air could be obtained with this arrangement with no noticeable loss in pressure. A one-inch oil line was used as a main lateral and quarter-inch feeders were connected to this.

The oil was heated indirectly by means of a single burner, a brick vault being made with baffles in it which caused the



Motor-Driven Four-Mold Berg Brick Press.

hot gases to pass around a coil of the oil pipe. This vault was placed at one end of the yard. This method of heating was not a success as the oil cooled off in cold weather before it reached the burners. Several other methods of heating the oil were tried. Pipes were placed above the kiln and the oil fed through these. It was thought that the hot gases would sufficiently heat the oil. The heat was so great, however, that the oil was in some cases converted into a gas and this caused fluctuations on the burners. The results obtained on the first kiln burned were as follows:

Number of brick in kiln	390,000
Net amount of oil used, barrels	350
Kilowatt-hours used	1,360
Duration of test, hours	105
Average load in kilowatts	13
Kilowatt-hours per thousand brick	3.23
Net barrels of oil per thousand brick	0.90

These results were considered very favorable for the first test, but the objections above mentioned together with a certain amount of opposition on the part of the labor element employed postponed the acceptance of the method. There is little

20-Horsepower Motor Driving Drum Hoist.

doubt, however, but that with the proper type of labor and the perfection of several mechanical details this method can be successfully applied to this business.

Desirable Class of Business.

The brick plant has a very good load-factor and is desirable business. They operate continously during the year and for that reason can make a very good showing on operating costs with steam. During the past 18 months due to inactivity in the building industry most of the brick plants in Texas have been forced to shut down for periods of from one to three months, and some of them have been shut down as many as six months during the year. For this reason they are not inclined to spend new capital in improvements even though by so doing they can decrease their operating costs.

Labor is employed on a basis of so many brick produced per day and hence electric drive has no advantage as far as production is concerned. It is strictly a matter of economy with the manufacturers in connection with the installation of electrical machinery. The engineer can be eliminated when electric drive is substituted for steam and saving can be made in lubricating oil, waste, repairs and other minor items. Boiler insurance must be continued, however, if steam is utilized for the burning process. Most of the plants have their own artesian wells and consequently their water costs them almost nothing.

Convenience of operation, flexibility of drive, facilities for keeping daily costs of production in the different parts of the plant, and elimination of power plant troubles are factors which assist in obtaining contracts for this class of business.

Examination for Radio Inspector.

The United States Civil Service Commission announces an open competitive examination for radio inspector, for men only, on January 19, 1916, at the usual places. From the register of eligibles resulting from this examination certification will be made to fill vacancies in the positions of radio inspector and assistant radio inspector at salaries ranging from $1,200 to $1,600 a year, depending upon the appointee's qualifications, in the offices of the radio inspectors of the Bureau of Navigation, Department of Commerce, at New York and San Francisco, and vacancies as they may occur throughout the United States in positions requiring similar qualifications.

The duties of radio inspectors will be primarily to inspect the radio apparatus on steamships, to insure its compliance with the law, and to inspect shore stations. The inspectors may also be called upon to examine radio operators. The duties of radio inspectors require some office experience, therefore competitors should outline fully in their applications any office experience they may have had.

The duties of assistant radio inspectors will be primarily the assisting of radio inspectors in the enforcement of the wireless communication laws. Assistant radio inspectors will be required to inspect the radio equipment on board vessels and in land stations, which involves the carrying of 30 or 40 pounds of testing and measuring instruments. The inspection work requires a knowledge of the installation and operation of the several types of radio installations, including the adjustment and tuning of transmitters and receivers.

Applicants for this position must have received a bachelor of science degree from a school of recognized standing, such educational training to have included a special course in radio or kindred sciences, or show that they are senior students in such institutions; or that they have had the equivalent of a high-school education and in addition not less than two years' experience in special radio work, such as the manufacture, installation, or adjustment of commercial or governmental wireless apparatus. It is desirable, but not essential, that they be wireless telegraph operators.

Water-Power Reconnaissance in South Central Alaska.

For several years the United States Geological Survey has been making a study of the water supply of parts of Alaska. At first this work was confined to Seward Peninsula; later it was extended to the Yukon-Tanana region; and Water-Supply Paper 372, just issued, describes the water resources of the region tributary to Copper River, Prince William Sound, and the lower Susitna. Stream measurements made during only one season can not, of course, be relied upon for estimating average flows, but the Survey engineers, C. E. Ellsworth and R. W. Davenport, besides making measurements of the flow of some of the streams, obtained much information on the topography of the drainage basins, reservoirs, and power sites. The data thus obtained, when combined with the Weather Bureau's records of precipitation, will serve as a general guide to the engineer, who, however, will at once realize that these facts must be supplemented by careful and thorough surveys and measurements before he can plan in detail any water-power project. The paper will at least show that the water powers available throughout the year are not so abundant in the south-central part of Alaska as has sometimes been assumed.

A Retrospect of Electrical Prosperity Week

The Story of What Was Accomplished and How It Was Accomplished Reveals a Co-operative Achievement That is Without Parallel in the Electrical Industry

By H. W. Alexander

In the history of great trade movements there has never been an undertaking more extensive in scope, more lasting in effect, nor more financially profitable than was Electrical Prosperity Week, the six-day celebration held throughout the country from November 29 to December 4, 1915. It achieved its full purpose, justified the claims of its supporters. It stands as a concrete example of the value of co-operative effort among the units of an industry. From reports on hand, it is fair to assume that more than half of the country's entire population came directly in contact with its inspiring influences.

Entirely unlike any of the "day" or "week" campaigns, this event took on the full aspect of a national celebration —a country-wide exposition of that prosperity which flows from electricity. Although distinctly a trade movement, it was far beyond a merely mercenary movement. It actually engaged the co-operation of every trade and every branch of industry. It reached far into the realms of optimism and psychology. It pointed the pathway to electrical prosperity, inspiring and drawing into its fold an unprecedented volume of outside public support.

The Week has left no regrets. It was approved by the President of the United States, just as it was welcomed by the humblest merchant in the land. It is destined to survive to vindicate the sound economic theory that business always is best after the public mind has been clarified and the public pulse restored.

The celebration was dedicated to a concerted effort upon the part of every branch of the electrical industry, the country over, to focus the public mind upon the already great achievements which have been made in the electrical field. The variety of uses which electricity has been made successfully to serve are almost infinite. The possibilities offered by it for adding to the convenience an economy of nearly all lines of human endeavor, whether in the home, shop or factory, are tremendous.

From its inception, electricity has proved its value. It has been a silent solver of business and domestic problems. There are few people today who still consider electric current a luxury. Its wide application, even in the homes of persons limited to modest weekly salaries for their income, has brought comforts and conveniences unknown a few years ago.

What It Did.

It stirred the electrical industry as never before, brought about co-operation between interests—central stations, manufacturers, jobbers, dealers, contractors—such as no other campaign could bring about.

It gave special prominence to electricity as a unified industry.

As a result of the extensive advertising the papers everywhere received in connection with the publicity given the Week, they will hereafter undoubtedly give more attention to electricity.

It brought electricity and its many applications to the notice of the nation as never before.

It instituted commercial activity in sections and by merchants who previously had not taken such a keen interest in a general trade movement.

It brought about the co-operation of interests outside of the electrical industry, such as department stores and other mercantile institutions, most of whose business lies in other directions.

The Society for Electrical Development was given prominence as one of the foremost development associations in the world. Its members are certain to derive great benefits from the prestige which it has thus received.

The campaign secured a large amount of new business instead of competitive trade, such as is often sought by individual interests.

The electrical shows and demonstrations held throughout the country revealed to the various cities the value of holding co-operative displays of goods on a large scale.

These exhibitions were highly successful everywhere and thousands of dollars' worth of orders for appliances were taken as a result of their educational effect upon the people.

Origin of the Week.

The idea of instituting such a movement was conceived at a time when the country was groaning under the burden of hard times. Business was dull. From every corner of the nation came reports of commercial stagnation. Such was the condition of the country when, on the call of J. M. Wakeman, general manager of the Society for Electrical Development, a meeting was held at his office in New York City on Friday, January 8, 1915, for the purpose of discussing plans for a national trade movement to rejuvenate the electrical industry and to incidentally stimulate business in other lines. The meeting was attended by publicity men and representatives of manufacturers, central stations, jobbers, dealers, contractors, the trade press and of technical journals.

It is altogether fitting that it should have remained for the electrical men to sponsor such a movement. Their industry, while young in years, has nevertheless grown by such rapid strides since its inception that today it stands a colossus among the world's greatest industries.

The following figures regarding the electrical industry will astonish those who look back a few years to the time when Edison invented the incandescent lamp. They show the gross income of electrical industries for the year 1914:

Electrical manufacturing	$ 450,000,000
Electric railway	730,000,000
Lighting companies	400,000,000
Telephone companies	350,000,000
Telegraph companies	85,000,000
Isolated plants	125,000,000
Miscellaneous plants	125,000,000
Total	$2,265,000,000

According to census figures, the estimated valuation of the nation's wealth in 1912 was $187,730,071,090. Of this amount the census bureau estimates that $2,098,513,122 is invested in privately owned central-station, electric-light and power plants. The total investment in all electrical industries, including telephone and telegraph, was estimated at $7,999,862,157.

This is 4.3 per cent of the total wealth of the nation, a large percentage when compared with some of the wealth invested in other leading industries. It is approximately 50 per cent of the steam railroads and their equipment and 33 per cent more than the value of all the live stock in the country. It is three times the value of all the nation's gold and silver coin and bullion and about 45 per cent less than the value of all manufactured products.

These figures are even more astonishing when one considers that the electrical industry is only in its infancy.

Organizing the Campaign.

Among the suggestions made as to ways and means of promoting the plan was that of enlisting the co-operation of the Jovian Order and other electrical societies and associations, and of national advertisers who might use their space in the magazines to arouse the interest of the public and to get their customers to make special window displays during Electrical Week; the co-operation of mayors and other functionaries of towns and cities; the co-operation of boards of trade, chambers of commerce and like civic organizations; the inauguration of "white way" lighting and similar attractions to bring people into the cities; a campaign on the part of electrical contractors to encourage all merchants to increase greatly their window illumination and display during the week; activities on the part of central stations in the way of offering prizes for the best lighted stores, best displays of other merchandise, as well as liberal advertising campaigns in local newspapers prior to and during the Electrical Week; parades of electric vehicles, floats, etc. It was suggested also that the Society prepare special posters for billboard and other use to be sold at cost to those desiring to use them in advertising the carnival, prepare special literature for distribution by central stations, supply dealers, contractors and others, arrange for lectures, special meetings, articles in trade papers, newspapers, popular magazines, etc.

It is interesting to note that most of these original suggestions were carried out in all parts of the United States.

Choosing the Name.

The choosing of a name is simple or momentous, according to the subject or event which is thus to be distinguished. If the appellation is to perform no other function than to distinguish one object or individual from another, it is not a difficult matter to decide. If, on the other hand, it is possible for the name to creat favorable or adverse impressions, it must be chosen with the utmost care. In the case of a business campaign or movement the impression which the mere title creates on the public may count for thousands of dollars in favor of or against the movement. Again, where various interests in different branches of a given line of business are concerned in the undertaking, the impression likely to be created may not accord with their commercial policies toward the public.

The name should be attractive and striking in effect. This fact is of the utmost importance in advertising. A catchy name appealing to the sense of human interest will often bring an advertisement to the attention of readers where a less attractive appellation would fail. This feature is rendered the more important in accordance with the extent of the advertising.

In the case of a national trade campaign, the impression of the title upon the various sections or localities of the country is also an important consideration. The people of the East may take a different view from those of the West. The North may differ from the South. To secure the most profitable results, all must be satisfied and pleased.

After many names had been suggested for the campaign and rejected as unsuitable, it was finally decided to call the celebration "Electrical Prosperity Week." The word "Prosperity" is wholesome, inspiring, positive. It was chosen as a part of the name of the celebration because it carried a popular appeal and at the same time conveyed the purpose of the movement. Prosperity appeals to all because it denotes progress. It is the result of efficiency, a broadening of the margin on the profit side of the ledger, a lessening of expense to produce a given result. Adding the word "Electrical" characterized the line of business along which it was primarily to be conducted.

The Time.

The time could not have been more propitious. It was set for the beginning of the Christmas shopping period, when every mercantile house in America is straining every means at its command to win its share of the Christmas trade. The people at that time are opening the traditional family stock in readiness for the greatest buying period of the year. Furthermore, the date corresponded with the closing week of the Panama-Pacific International Exposition. The management of the Exposition offered to co-operate in the movement by setting for the spirit of the Week in a blaze of illumination, parades and other events arranged especially for the celebration. The Week also came at a cool season, when people were actively receptive.

Appropriations.

The executive committee recommended an appropriation by the Society for Electrical Development of $50,000 for special expenditures, such as printing and extraordinary expenses. A large amount of the Society's regular appropriation was also devoted to the work. The expenditures of the Society alone totaled over $100,000. This money came from the regular subscription of the members. The members justly received the greater benefits from their expenditures, but the whole country and industry profited from the educational and sales work.

The work of the Society in planning this great campaign has greatly stimulated its growth in membership, particularly in lighting companies.

In addition to the expenditures which were made by the Society, leading electrical manufacturers and jobbers spent thousands of dollars in national publicity. Each company worked in conjunction with the Society. Thousands of central stations, manufacturers, dealers and jobbers throughout the country took advantage of the national campaign to institute local campaigns of their own during the Week.

Announcing the Week.

The first active work undertaken was the forming of local committees to handle the various sections of the country. The next step was to inform the public of the movement. As long ago as February, columns of news appeared in the principal papers of the United States telling their readers how (to quote from headlines of one New York paper) "Electricity Was to Hit at Hard Times."

The next step was to reach the various branches of the electrical industry, without whose whole-hearted co-operation the Week could not have been made a success. Thirty thousand copies of a "Book of Plans" were distributed to members and non-members of the Society. Reply postal cards which were distributed came back by the thousands signifying intention to co-operate and asking how co-operation could be best accomplished in their particular localities. A definite reply was sent to each of these.

The book was followed by "How To" booklets, directed to each branch of the industry separately. They gave definite instruction as to how to run special exhibitions, parades, window displays, street lighting and sales campaigns for the Week.

Bill-Posting Campaign.

Another means instituted by the Society for Electrical Development for giving broadcast publicity to the Week consisted of a bill-posting campaign. The posters provided were of the 8-sheet variety that could be used singly or be made up into 16 or 24-sheet broadsides. They contained the Goddess Electra emblem of the celebration, lithographed in six colors. At the bottom was left a space for the name of the firms making use of the posters. The sheets were placed on the most prominent billboards and were displayed during the time when numerous other means were used to promote electricity and Electrical Prosperity Week.

Display Bureau Service.

It was apparent from the first to those in charge of the movement that the co-operation of the merchants and commercial men of the non-electrical lines of business would be highly important. It was essential that show windows attractively tell the purpose of the campaign and that stores be specially lighted.

This branch of Electrical Prosperity Week activity was entrusted to the Society's Display Service Bureau. At the annual convention of the International Display Men's Association in the Waldorf-Astoria Hotel, New York, beginning August 2, addresses were made on what Electrical Prosperity Week would mean to the merchants of America. More than 1,200 delegates were present.

The Display Bureau placed numerous articles on Electrical Prosperity Week and the Society for Electrical Development in the trade press. Many of these publications ran special Electrical Prosperity Week issues and used the Electra design on the covers.

These activities of the Display Bureau were highly instrumental in bringing about the hundreds of unusually attractive window displays of electrical appliances and the beautifully decorated store fronts and interiors which were seen during the Week throughout the country.

General Publicity.

The mass of press clippings now at the campaign headquarters warrant the assertion that it is unlikely that any trade campaign in history ever brought to the newspapers the wealth of advertising this Week discloses. One bundle of clippings reached the Society's office which contained 570 clippings. Of this number, 347 were full pages of advertising.

This result is a most gratifying one. From the inception of the campaign, the Society for Electrical Development continually urged local electrical concerns to adopt the newspaper as a medium of communicating the Week's message to its people. The Society engaged a staff of nationally noted newspaper and advertising men to specifically further this aim.

Mr. Wakeman set aside a liberal appropriation for electrotypes, matrices, headings and even color plates. These were furnished upon request and without charge to newspapers everywhere. Thousands of newspapers received the Society's advertising helps, and in many cities where the local electrical advertisers seemed lethargic, the Society directly urged these advertisers to get in back of their enterprising newspapers. Much substantial missionary work of this character served to bring new accounts to newspapers.

In addition to the publicity gained through the newspapers the trade press gave powerful support to the movement by carrying the message to the tradesmen, professionals and artisans of the country in a manner which showed them clearly how they could "cash in" on the movement by joining the ranks of the boosters.

Week Met Expectations.

The Week and its aims succeeded beyond all expectations. Every man who adopted its slogan, every institution which accepted its message, and every newspaper which stood back of its credo have benefited and have "cashed in." It was a distinctive factor in a business climb unprecedented in the nation's history.

It is yet too early to recite its financial returns. It will be weeks before the thousands of central stations, manufacturers, jobbers, dealers and contractors of the electrical industry are able to definitely state the actual cash results. It may be weeks before all the dry goods stores, decorators, merchants of every kind, and the chambers of commerce, boards of trade and civic organizations report the good that the Week brought to them.

As an educational achievement it stands by itself. Beyond estimate the electric parades, the electric shows and the electric demonstrations in dozens of cities have left lasting benefits. Great quantities of electrical appliances for the home have been sold. The newspaper advertising, begun under the stimulus of the Week, is being continued over the holidays, the appeal being the useful electrical Christmas gift.

The full benefits of Electrical Prosperity Week are not confined solely to the profits on the sales that were made during the celebration and the Christmas shopping period, which started with the Week. On the contrary, the results will extend over months to come. Countless thousands of people from every walk in life attended the electrical shows held in many cities. They saw features which were new to them, learned many facts they had not known before. They saw electricity at work, and gained a new impression of its usefulness, the broadness of its scope.

It can safely be said that many people were induced to think seriously over the electric heat, power and light question, who previously had considered electricity an expensive commodity. A large proportion of these are certain to become prospects as the convictions of the economy of electricity grows upon them. They may not make their purchases for many weeks to come, but that they will adopt the "Electrical Way" eventually, can be counted as one of the achievements of Electrical Prosperity Week. Herein lies the educational value of the celebration. It has brought the modern worker of wonders into the limelight. Generalities have given way to definite facts and figures. Understanding has taken the place of mystery. New ways of doing things have been learned. The light of truth has penetrated the mists of doubt.

Again the public has been brought into a closer acquaintance with the central stations which serve them. Their impressions of these interests have been raised. Where suspicions of greed formerly existed, there is now in many cases a feeling of confidence. The people have been shown how the companies operate, have gained a clear idea of the expense of current generation, have been shown that the profits were not exorbitant nor excessive. The companies generously stood ready to explain their systems to the people. The good impression thus created on the public is certain to be effective in preventing future controversies between the electrical interests and their patrons.

The influence has also extended to the chambers of commerce of many cities. They have seen the beautiful effects of flood-lighting, as applied to their own cities, and the appearance of their streets under increased illumination. This fact is likely to result indirectly in the future increase and improvement of the lighting of many cities.

The aggressiveness of the electrical industry, its scope and resources has been brought more closely to the attention of business men and institutions. This has served to increase the prestige of the industry.

Such have been some of the results of the celebration. They have been inspiring to the industry itself, healthy to general business. The country has profited well. The great movement has been a pioneer in its class. Its success will undoubtedly lead to the holding of more such celebrations, which cannot fail to increase in scope and volume as their good works become better known to the people as a whole. The ultimate effect of these movements upon America's institutions is certain to be of far-reaching, lasting and positive benefit.

The forty-sixth annual meeting and dinner of the Western Society of Engineers will be held on the evening of January 12 at the Hotel Sherman, Chicago. It will mark the inaugural of the newly elected officers. Several addresses will be made, the principal one by Samuel Insull, president of the Commonwealth Edison Company.

COMMERCIAL PRACTICE

New Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

Making Utility Customers Financial Partners Shows Gratifying Returns.

An effective effort to improve the relations of utility companies and the public by making financial partners of a considerable number of consumers has been in progress during the past year by several large service companies operated from Chicago.

In some instances citizens have been offered the preferred stock of holding companies; in others, investment in interest-bearing securities has been made available in denominations as low as $50. The securities are obtainable either direct from the local operating unit or one of the leading banks.

According to observers who have followed these overtures towards bringing the public and the companies closer together, there is every reason to expect that the widespread distribution of securities and earnings in home territory will practically do away with unfair agitation against progressively managed corporations.

Two of the Chicago managed utility holding companies which have tried out plans of this kind are the Northern States Power Company and Standard Gas & Electric Company, both controlled by H. M. Byllesby & Company. The Northern States organization operates in Minneapolis, St. Paul, Mankato, Faribault, Fargo, Grand Forks, Sioux Falls, the Illinois-Wisconsin zinc fields, and other communities. In June, preferred stock was offered to the customers served, and by the close of the year approximately $250,000 of the stock had been taken in small lots by some 40 citizens, a number purchasing on the partial-payment plan. The effect on public sentiment was very encouraging, and the stock sales will be continued.

In the recent successful financing by Standard Gas & Electric Company, the company's twenty-year six-per-cent gold notes were offered to the public in a number of the cities served by operating units, including San Diego, Pueblo, Oklahoma City, Mobile, Stockton and Ottumwa, and what was considered a satisfactory amount was taken for local investment. Newspaper advertising was used extensively by both companies.

The closing year shows a decided improvement in the electric light and power and gas industries throughout the country, according to the officers of H. M. Byllesby & Company, which firm operates thirty-five companies scattered through sixteen states and serving a population of 1,730,000. Earnings, they say, have advanced in conformity with the general industrial revival, except in Oregon and Washington and some sections of the South.

Northern States Power Company, whose subsidiaries serve the principal cities of Minnesota and North and South Dakota, made an excellent showing during 1915, net earnings having increased approximately 20 per cent, and the balance, after payment of fixed charges, 31 per cent. Growth of business made necessary the addition of 26,000 horsepower to the steam generating plants of the company. Prospective increases during the next few years caused the company to contract for a large amount of power, to be delivered from a new hydroelectric development on the Chippewa River near Chippewa Falls, Wis.

Standard Gas & Electric Company greatly improved its position during the latter part of the year by the sale of long-term notes and restoration of cash dividends on the preferred stock. The sale of these notes, which will retire the short-maturity obligations of Standard, marked a turning point not only in the affairs of this particular company, but in the general financial situation as related to public utility enterprises, which for some years have had to resort to short-term notes to raise any considerable amount of money.

Pacific Power & Light Output Shows Big Increase.

The Pacific Power & Light Company, operating at Portland, Ore., and vicinity, has issued an interesting statement of its kilowatt-hour sale statistics for the last fiscal year, 1914-1915, showing a total output of 45,473,923 kilowatt-hours. This is an increase of over 5,000,000 kilowatt-hours for the preceding year, which aggregated 39,782,618 kilowatt-hours; the total sales during this period amounted to 27,696,561 kilowatt-hours, as against 32,301,832 kilowatt-hours for the twelve months just closed. An analysis of the 1914-1915 period shows the following results:

Account.	Kilowatt-Hours.
Commercial Lighting—metered	5,498,052
Commercial Lighting—not metered	921,286
Commercial Power—metered	12,548,366
Commercial Power—not metered	3,934,917
Municipal Arcs	1,607,447
Street Lighting, incandescent	626,751
Street Lighting, private	76,072
Other Electricity—Public Service Corporation	1,012,988
Irrigation Power	6,075,953
Total sales	32,301,832
Company Railway, Astoria, Ore.	406,062
Used elsewhere by company	801,077
Total sales and use	33,508,971
Sold by power department	9,272
Distribution losses	4,228,611
Feeder output	37,746,854
Transmission and transformation losses	7,727,069
Total plant output and bought	45,473,923

Minneapolis Company Sends Holiday Greetings to Customers.

H. E. Young, sales manager of the Minneapolis (Minn.) General Electric Company, is responsible for the idea originated by the company this year of sending Christmas and New Year's greeting cards to all customers and prospective customers. Each member of the sales department sent out about 200 of these cards, which are engraved and specially folded so as to contain the business card of the sender. That this courtesy on the part of the company's representatives was well received is indicated by the receipt of several hundred letters expressing appreciation and thanks. A typical letter selected at random reads as follows: "I wish to acknowledge receipt of your Christmas greeting and also the Christmas present in the form of electric service which was furnished to us and the people in our neighborhood last Friday afternoon. Thanking you for your kind wishes and your efforts in our behalf, and wishing you the compliments of the Season, I am, etc.

Municipal Plant to Buy Electricity.

The voters of the town of Hull, Mass., decided in town meeting December 22 to close down the municipal electric light plant and purchase energy from the Weymouth (Mass.) Electric Light and Power Company. The station will not be dismantled, but the machinry will be idle. The town retains its poles, wires and street equipment.

The vote authorized the purchase of current for a term of not more than 10 years, at the rate of three cents a kilowatt-hour. For some time energy has been purchased from the Weymouth Company to meet the day demand, at two cents a kilowatt-hour, and the proposition which will doubtless be accepted stipulates that if the day load exceeds that of the year previous, the rate for energy supplied from Weymouth shall be two cents a kilowatt-hour for the overplus. Energy will be measured at the switchboard of the Hull station.

"Day load" is energy taken between the hours of 1 a. m. and a half hour before sunset.

The town is largely sumer residential, being located on the seacoast near Boston. The Weymouth Company offered to purchase the plant, at about $160,000. A committee of eleven, including the selectmen, recommended the proposition that was substantially adopted. By this method, the 20 cent summer rate will be reduced to about 17 cents, and the rate of 15 cents to permanent residents will be reduced to 14 cents.

Hydroelectric Power to Be Developed and Sold to Edmonton Municipal Plant.

The Edmonton Power Company, Limited, is planning to build a solid concrete dam, 1,500 feet long and 100 feet high, on the Saskatchewan River, above Rocky Rapids, making an artificial lake about 60 square miles in area. Electricity will be generated in a power plant below the dam and brought to Edmonton, Alberta, Canada, on a steel-tower transmission line. At Edmonton it will be stepped down in the company's substation and will be sold in bulk to the city to deliver to the various departments and consumers as at present. The company is to be granted no franchise within the city and will have nothing whatever to do with the civic departments or private consumers.

This development will cost approximately $6,000,000, not including an electric railway, which, as a separate scheme, will be built from Edmonton to the proposed power site.

The building of the electric railway and complete power development will take at least four years, and, in order to enable the city to establish a rate schedule immediately, based on known power costs for 30 years, and thus secure customers now available in the city, as well as new industries, the company agrees to take over and operate the present city steam plant.

Practically all of the public utilities in Edmonton are owned and managed by the city, and this private undertaking is receiving the support of a number of citizens who believe that municipal ownership has not been profitably demonstrated in Edmonton.

New Street-Lighting Installation for Norwalk.

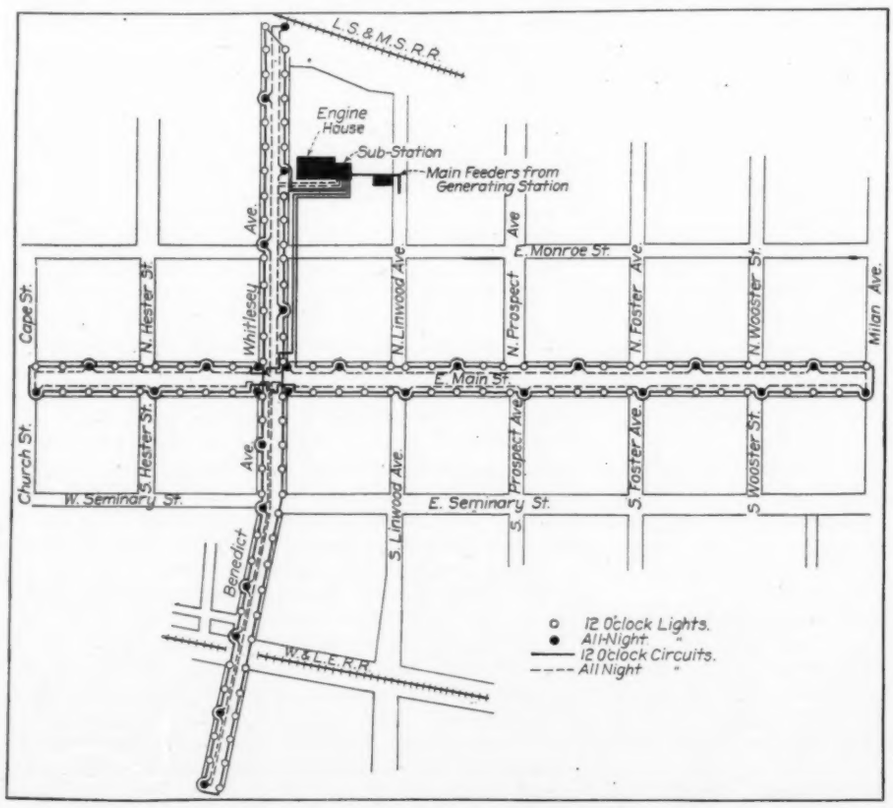
A new street-lighting installation using nitrogen-filled tungsten lamps has recently been completed for the city of Norfolk, O. There are a total of 134 400-candle-power 6.6-ampere, type C lamps used, one to a standard. As shown in the accompanying layout, there are ten lamps to a block, three of which are arranged for all-night burning. These lamps are wired on a separate circuit which is controlled from the substation shown in the view.

The remaining 105 lamps are lighted from dusk to midnight, this circuit also being controlled from the city substation.

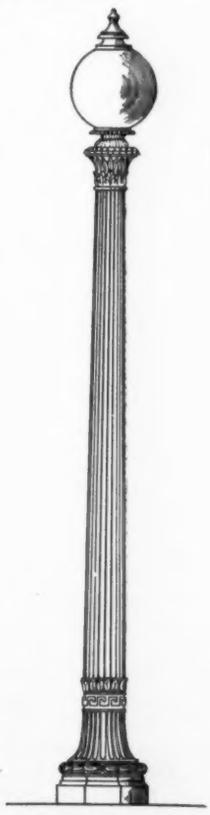
The installation is of the series type. Standard Underground Cable two-conductor steel-tape cable is used.

The design of the ornamental standards used is shown in the detailed view.

The construction work was done for the city by the Powers Electric Company, of Norwalk. The cost of this installation amounted to about $70 per standard.



Plan of Norwalk Street-Lighting Installation.



Detail of Standard.

Commercial Growth of Southern California Edison Company Told by R. H. Ballard.

The Southern California Edison Company started in Los Angeles in 1896 as the Westside Lighting Company as a small steam-plant distributing system.

The company was enlarged and its name changed in 1898 to Edison Electric Company, and in 1909 to Southern California Edison Company. In the meantime many properties outside of the city had been purchased and the company's affairs extended generally throughout Southern California.

The principal properties purchased were: Santa Ana Gas & Electric Company, Southern California Power Company, Pasadena Electric Light & Power Company, Redlands Electric Light & Power Company, California Power Company, United Electric Gas & Power Company, Lytle Creek Power Company.

Large contracts were made to supply power to the two cement plants in Riverside and Colton, and in 1907 the company began furnishing service to the Los Angeles Pacific Railway, which is now part of the Pacific Electric system, embracing the lines running to Santa Monica and Hollywood sections.

The gross earnings of the company in 1896 were only $3,333 for the year, while the earnings in 1915 for its electric department were $4,427,000.

The increase in kilowatt-hour sales during almost the entire period has been much greater than the increase in earnings, as rates have been constantly reduced, the average rate in 1915 for the entire system in Southern California being only 40 per cent of the rate in 1905; in other words, a reduction of 50 per cent in ten years.

The maximum load on the company's stations in 1904 was about 10,000 kilowatts, while in 1915 it was nearly 56,000 kilowatts.

These facts were brought out by R. H. Ballard, secretary and assistant general manager of the company, in a hearing recently before the Railroad Commission of California in the matter of the application of the city of Los Angeles to condemn the distributing system of the Southern California Edison Company.

Testifying further as to the effect of cutting out the Los Angeles business from the balance of the system, Mr. Ballard showed that the gross earnings would be reduced from $4,400,000 to $2,300,000—a reduction of nearly 50 per cent—and that, while it is estimated the maximum load on the stations would be recovered in eight years, in the eighth year, 1923, the earnings would still be $700,000 a year less than they were before Los Angeles was taken out of the system, due to decreased efficiency.

Kilowatt-Hour Output Over 208,000,000.

Likewise the number of kilowatt-house sold during 1915, over 208,000,000, would be reduced by the loss of the Los Angeles business to 110,000,000. During the next eight years they would increase to 178,000,000, being approximately 30,000,000 kilowatt hours less than before Los Angeles was taken away.

It was shown that the combination of the Los Angeles and outside business was particularly advantageous from the standpoint of efficiency and economy, as the maximum demand for current in Los Angeles comes in the winter time, while the maximum demand for current outside ot Los Angeles comes in the sumer time.

The same plants which furnish the large winter demand on Broadway at Christmas time, are used in the summer time for pumping water for irrigation in the districts outside of Los Angeles, resulting in a lower cost both inside and outside the city, which is reflected in the company's rates to consumers. In other words, there is a great diversity between the city and the outside.

Referring to rates in the city of Los Angeles, Mr. Ballard showed that in 1905 the maximum rate for residence service was 15 cents per kilowatt-hour; in 1908 the rate was 9 cents per kilowatt-hour—a reduction of 6 cents in three years; in 1911 it was 7 cents per kilowatt-hour, and in 1915, 5.5 cents per kilowatt-hour.

Outside of Los Angeles, the rate in the districts served by the largest company purchased by the Edison Company in 1904 was 20 cents per kilowatt-hour, and at the present time it is 7 cents per kilowatt-hour.

Successful House-Wiring Campaign Conducted at Rutland, Vt.

The house-wiring campaign which was inaugurated by the Rutland Railway Light & Power Company, Rutland, Vt., late in September, has resulted in the securing of 350 new customers. The company arranged with several of the wiring contractors of the city to wire houses at a flat rate of $2.25 per outlet, not including fixtures. The contractors agreed to finance the work on the installment plan, making a uniform discount of 10 per cent for cash.

The Rutland Railway, Light & Power Company used liberal advertising space in the two daily newspapers and considerable publicity was given the campaign in other ways. Especially prepared lantern slides were used in all motion-picture houses and on Edison Day a special reception was held at the company's offices where special attention was given the promotion of house wiring. Over 1,000 chrysanthemums were given out as souvenirs. A comprehensive display of electrical appliances was maintained and demonstrations made of their usefulness.

Considerable impetus was given the campaign by Electrical Prosperity Week and the company took advantage of the many opportunities afforded to increase the interest in electricity. Incidental to the house-wiring activities a window-display contest was inaugurated through the efforts of the central station, working in co-operation with the Rutland Business Men's Association and prizes amounting to $60 were given for the best dressed and lighted windows. A children's essay contest was also carried on, the subject being "Why Electricity Is Our Best Servant." Prizes were awarded for the three best essays.

In addition to the business which was created for local supply dealers and contractors because of the house-wiring campaign, later supplemented by Prosperity Week activities, the light and power company reports an increase in connected load without parallel in its history.

Nashville Celebrates Christmas Electrically.

The Nashville, Tenn., Jovian League, in co-operation with other civic bodies, held its annual public Christmas-tree celebration on the night of December 24. Despite unfavorable weather, the affair was successful and the tree, which had been decorated by the local Jovians, aroused much admiration. It was placed in the center of Capitol Boulevard, a broad street leading off of the principal thoroughfare to the State capitol, and which was closed to traffic during the evening. It was anchored in a base of broken rock, retained with a small wall of paving stones and covered with evergreen branches. It was decorated with 500 electric lights of various sizes and surmounted with a large electric star. The Nashville Railway and Light Company contributed the current as well as bringing the Sunday-school classes of the city without charge.

Important Electric Bake Oven Installation in Los Angeles.—Nutt Brothers bakery of Los Angeles, Cal., have installed recently an electric oven of Hughes manufacture for baking small cakes and pastry. This oven which has a capacity of 100,000 cookies per day, is provided with automatic thermostatic control insuring a continuous temperature of 360 degrees.

POWER ENGINEERING

Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

Important Industrial Heating Business Secured by Los Angeles Company.

An important acquisition to its power business has recently been made by the Southern California Edison Company in the form of a 600-horsepower industrial electric heating load for the Ford Motor Company's Los Angeles plant. The present installation comprises two enameling ovens for automobile hoods and fenders which are to be equipped for electric heating.

At the Los Angeles works of the Ford Motor Company there is at present installed 250 horsepower in motors and the electric ovens will be equipped with two 225-kilowatt heating units equivalent to 600 horsepower additional load. This additional load will have to be increased to 900 horsepower, making a total of 1,150 horsepower installed.

The ovens are located on the top floor of a five-story building, and in order to deliver the required energy without excessive secondary loss the problem of installing transformers weighing 15 tons, on the roof, is one of no little consequence. In addition to this weight it may be necessary to construct a brick vault to contain the transformers in accordance with the city requirements.

The four ovens are 10 by 12 by 30 feet each and will require to be heated to a temperature of 450 degrees Fahrenheit for 6 hours per day. Of the many advantages to be gained by the electric oven the more important are the reduction of fire risk by eliminating gas and that fact proved that from 40 to 50 per cent increase in the finished product is obtained. These facts more than compensate any difference in the initial expense and fuel cost versus electrical energy.

Condensation results from the burning of gas. This tends to dull the finish of the enamel to a certain extent, whereas radiant heat generated by electrical energy eliminates this objectional feature, resulting in a much brighter finish.

In addition to the electric ovens there will probably be installed for this company an equipment for heating babbitt. This will require about 50 kilowatts additional, therefore a total connected load of over 1,200 horsepower is assured.

Program of Ohio New-Business Meeting.

A meeting of the new-business committee of the Ohio Electric Light Association will be held at the Portage Hotel, Akron, O., on January 19. A comprehensive program of interest to new-business men of central stations has been arranged which includes a paper by J. R. Colville, of the National Lamp Works, entitled, "The Mazda Lamp in Photography," paper by J. C. Matthieu, power engineer of the Dayton Power & Light Company, entitled, "Electric Furnace," and a general open discussion on the following questions:

(1) Is it good policy to sell appliances on the installment plan?

(2) What is the best plan in paying central-station salesmen?

(3) What is the best way to increase minimum charge to consumers?

(4) How much can the central station afford to pay for old house business?

At the close of the meeting a visit will be made to the plant of the Miller Rubber Company, which has a complete electrical installation.

J. E. North, of Springfield, O., is chairman of the committee.

Comparative Costs Between Acetylene and Arc Welding.

In the accompanying table are given some interesting data comparing the cost of electric arc welding with acetylene. These figures, which were based on tests made with a Lincoln welding machine, are based on the following costs:

Acetylene .....1 cent per cubic foot
Oxygen .....2 cents per cubic foot
Electricity .....2 cents per kilowatt-hour
Labor .....30 cents per hour

In the small sizes of metal the speed of acetylene welding is greater than that of electric, while in the larger sizes, the speed of electric welding is much greater. The calorific value of acetylene is 1,555 British thermal units per cubic foot. One kilowatt-hour is equivalent to 3,413 British thermal units.

COMPARATIVE COST DATA—ACETYLENE AND ELECTRIC ARC WELDING.

Tip No.	Thickness of Metal	Cu. Ft. Per Hour		Ft. Weld Per Hr.	Cost of Gas	Total Cost Per Hour	Cost Per Ft. Welded	Amperes in Arc	K. W. Input M-G Set	Cost of Power	Ft. Weld Per Hr.	Total Cost Per Hr.	Cost Per Ft. Welded
		Acetylene	Oxygen										
1	1/16"	3.21	3.65	30	$ .11	$ .40	$ .013						
2	1/8"	4.84	5.50	25	.16	.46	.018	70	3.00	$ .06	25	$ .36	$ .014
3	3/16"	8.14	9.28	20	.27	.57	.028	75	3.08	.06	20	.36	.018
4	1/4"	12.50	14.27	15	.40	.70	.047	80	3.20	.06	15	.36	.024
5	5/16"	17.81	21.32	9	.61	.91	.101	90	3.52	.07	10	.37	.037
6	3/8"	24.97	28.46	6	.82	1.12	.187	110	4.15	.08	8	.38	.048
7	1/2"	33.24	37.90	5	1.09	1.39	.278	110	4.15	.08	8	.38	.048
8	5/8"	41.99	47.87	4	1.38	1.68	.420	120	4.64	.09	7	.39	.056
9	3/4"	57.85	65.95	3	1.90	2.20	.733	150	5.75	.12	6	.42	.070
10	7/8"	82.50	94.05	2	2.71	3.01	1.510	150	5.75	.12	6	.42	.070

WATER SUPPLY FOR THE TOWN OF CANTON.

Electric Pumping System Effects Economies Over Steam.

The new motor-driven centrifugal pumps at the Springdale Pumping Station which furnish the entire water supply for the town of Canton, Mass., have now been in successful operation for some time. The installation is of particular significance because it was one of the first installations in that part of the country where centrifugal pumps are used for pumping against a moderate pressure and the equipment has proved of advantage in many ways.

Water is taken from a large open well, the clear spring water bubbling up through the sandy bottom. It is raised by the electric pumps from four to 20 feet according to the level in the well and pumped two miles to the standpipe on a distant hill.

The total amount of water pumped last year was 106,000,000 gallons again an average working head of 190 feet or 82 pounds. The energy required to do this work amounted to 120,000 kilowatt-hours. It was purchased at an average rate of 2 cents per kilowatt-hour.

The previous steam equipment which had been in use for 24 years consisted of two horizontal boilers and two large Knowles compound duplex steam pumps of 700-gallons-per-minute capacity, with condenser and boiler-feed pumps. This equipment required a substantial brick station, engine room, boiler room, stack and building for storage and coal.

The new electric equipment consists of one 400-gallon-per-minute DeLaval three-stage centrifugal pump direct-connected to a 25-horsepower motor, running at 1,750 revolutions per minute, and one 700-gallon two-stage pump direct-connected to a 75-horsepower motor. The 75-horsepower pump is reserved for fire use only and all water is pumped by the 25-horsepower outfit.

The small space occupied by these pumps made it possible to install both electric pumps in the space previously occupied by one of the steam pumps. The simplicity of these units may be seen in one of the accompanying illustrations and their relative sizes compared with the previous boilers and pumping engines.

During the past year the cost of electric power has been less than the cost of coal used by the steam pumps, and a saving of over $100,000 has been made in labor. On the other hand the income from the sale of metered water service has been increased from $12,826 to $14,432. This increase, although not anticipated, was largely due to the high water level maintained in the standpipe, resulting in increased use. The coal used during the previous year when 10 per cent less water was pumped by the steam pumps amounted to 442 tons costing $6.00 per ton.

A Cutler-Hammer starter is used, the relay current of which is connected to three different forms of controllers, as follows:

Old Boiler Installation Which Was Removed.

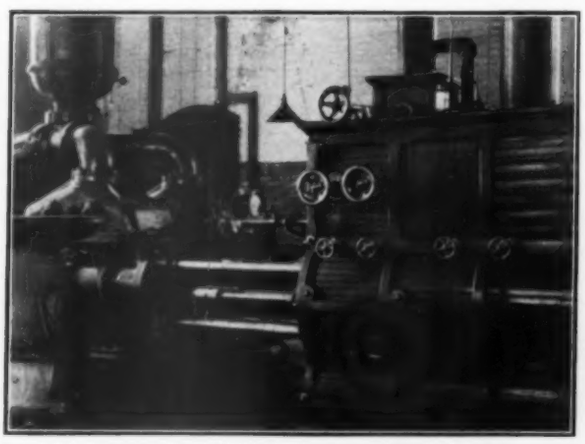
(1) A float switch in the well which stops the pump when the well is empty and prevents uncovering the check valve.

(2) A pressure gauge which starts the pump when the water level in the standpipe drops unduly.

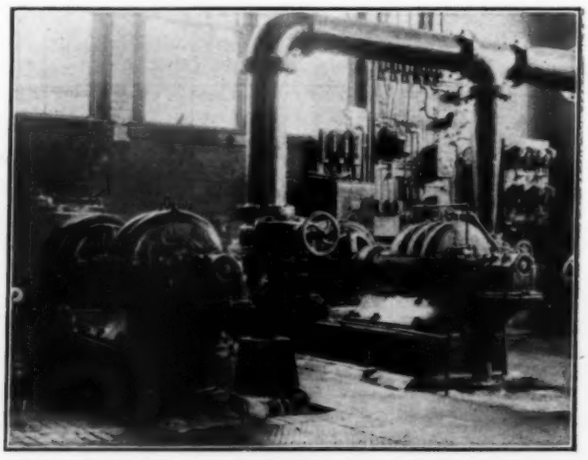
(3) A time clock which starts and stops the pump three times each day on a regular schedule—morning, afternoon and midnight.

Although the centrifugal pump is less efficent than the plunger type, it has many advantages which are of direct value in this installation, namely, reliability, absence of valves, easy starting and automatic features which more than offset the low cost of the additional electric power consumed. The long, slow pumping day and night saves energy in pipe friction; maintains the standpipe practically full and at the same time earns a low rate for electric power.

Energy is supplied to this installation by the Edison Electric Illuminating Company of Boston and J. W. Wattles, commercial engineer, had charge of the engineering work involved.



Previous Steam Pumping Engine—Canton Station.

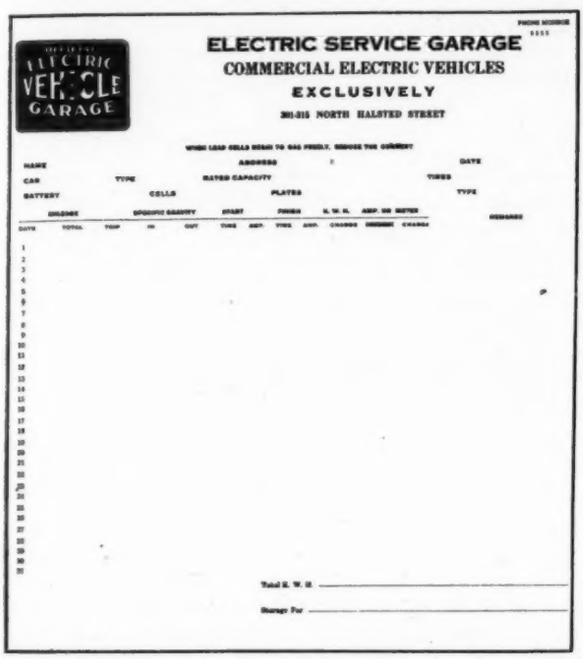


Motor-Driven Pumps in Space Occupied by One Engine.

ELECTRIC VEHICLES

A Noteworthy Style of Billhead for Electric Vehicle Garage.

Because of the service demanded by the average user of electric passenger cars, electric vehicle garages necessarily have had to make a flat rate which included the cost of this service. The extension of the small electric commercial vehicle depends, however, to a very large extent upon obtaining garage facilities where charges will be made based on the cost of electricity consumed in charging batteries, plus an additional charge for storage and extra service, when this is demanded. The user who operates a half-ton truck four days a week justly has cause for


ELECTRIC SERVICE GARAGE
COMMERCIAL ELECTRIC VEHICLES
EXCLUSIVELY
201-215 NORTH HALSTED STREET

Style of Billhead Used by Commercial Vehicle Garage, Providing Space for Entering Daily Performance of Car.

complaint if he is made the same flat rate as the user who operates his vehicle six days a week.

The Electric Service Garage, of Chicago, was established to handle commercial electric vehicles exclusively. Rates for service are based on an electricity charge of five cents per kilowatt-hour, in addition to a moderate storage charge, depending upon the floor space occupied by the vehicle. Washing, inspection, repairs, etc., when requested, are charged for extra. In accordance with this basis of charging, the garage has prepared for use a billhead which places before the user a complete report of the vehicle's operation during the month covered by the bill. The billhead is really a duplicate of the switchboard report which is maintained for every vehicle. It shows the daily mileage of the vehicle, the specific gravity of the battery, the kilowatt-hour input for each day, etc. As shown in the accompanying illustration, space is left for remarks, where notations relative to washing or repairs, etc., are made. The user, by a perusal of this bill, can tell instantly just what service he has obtained from his car and what service has been rendered by the garage.

Several vehicles kept in this garage are operated only a portion of each day, in two cases batteries being charged only three times a week. Were a flat rate charged, the operation of these cars would be unprofitable.

Electrically Driven Fire Apparatus Makes Successful Hill-Climbing Test in Paterson.

A demonstration of electrically driven fire apparatus was held on the steep grades in and around Paterson, N. J., on Thursday afternoon, November 18. This proved a great success and showed beyond doubt the speed, power and flexibility of this type of apparatus.

The two pieces used for demonstration were as follows: a combination chemical engine and hose wagon, converted from horse drawn to motor driven, by the Commercial Truck Company of America, Philadelphia, Pa. This was fully equipped with twenty lengths of hose and a crew of fourteen men. The weight of the truck, light, is 8,500 pounds and equipped with the hose and crew, 12,320 pounds.

The second piece of apparatus was a 65-foot aerial ladder, which was also a converted horse-drawn truck built by the same company and carried a crew of 22 men. The weight of this piece was, light, 18,000 pounds and with the regular crew, 20,000 pounds. This latter piece was of the four-motor-drive type, one motor being attached to each wheel. Both were equipped with Exide batteries.

The first part of the test consisted of a run up an 18.23 per cent grade known as "Temple Hill" having an uneven cobble-stone paving affording very poor traction. This test was easily made by both cars, the time from a dead start at the foot of the hill to the summit being, for the combination wagon, 1 minute, 13 seconds; and for the ladder truck, 1 minute, 18 seconds. This former becomes a record for the hill, which has been used as a test hill for every piece of apparatus used by the Paterson Fire Department and many others which have had aspirations, but have failed on the test. The fastest previous time was 1 minute and 40 seconds, made by a gas combination truck. The electric pieces under test were again sent up the hill, stopped dead in the center of the steepest part, and then run to the top at the same speed as before. This remarkable feat was very generously applauded by a gallery of some hundreds of spectators.

The remarkable part of the latter test was the apparent immediate resumption of speed from a dead stop on the grade which has proved too steep for most of the other types of fire apparatus to climb at all, and which the number of touring cars carrying spectators did not even attempt.

The apparatus was next put through a test on the hill known as the "Temple Street-Clinton-Street-Circle Avenue Hill"; this is also over an 18 per cent grade, and both pieces easily made the trip, the ladder truck making a new record of 1 minute, 14.5 seconds.

The facts that these two pieces, both stock and not especially prepared for the test, not only met all requirements without effort, but in both cases, where previous records have been kept, established new records by a wide margin, aroused keen interest among the large number of officials present, which will no doubt be practically expressed, when their several cities are next in need of fire apparatus."

After the tests, the apparatus were given a boosting charge and started back on their return trip to Philadelphia. At Newark a stop was made to exhibit the pieces to the fire board there, where another short demonstration was given and again at Elizabeth the cars were shown to the local fire board.

It is interesting that the run up from Philadelphia to Paterson, approximating 125 miles, was made in fourteen hours, elapsed time. This included stops at Trenton, New Brunswick and Newark for boosting the batteries.

As a result of these tests several municipalities in the East have asked for some information relative to electric apparatus.

ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

OUTSIDE WIRING.

By Terrell Croft.

In carrying conductors on the outsides of buildings, they may, where unprotected from the weather, be supported on standard porcelain or glass insulators, as indicated in Fig. 1. In purchasing such brackets, care should be taken to select those that provide at least the one-foot separation required between conductors. In Fig. 1, II, *A*, is shown a special extension bracket whereby the conductors are supported a considerable distance from the side of the building to avoid contact with the downspout.

Roof structures should, as shown in Fig. 2, carry their wires at least seven feet above flat roofs, so that a person can readily walk under the wires and so that, even if the wires do sag, they will not be likely to touch the roof. With a peak roof, a one-foot clearance, as shown in Fig. 2, is sufficient, because with a roof of this type there is little likelihood of a person walking on the roof contacting with the wires, or of the wires sagging sufficiently to touch the roof. Roof structures may be effectively made of wrought-iron pipe and fittings, or of structural steel, these materials

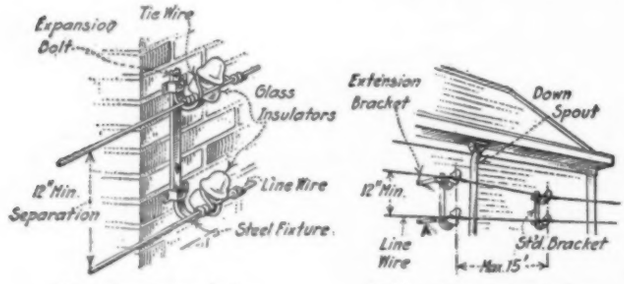


Fig. 1.—Approved Methods of Supporting Conductors on Building Exteriors.

providing sightly, and probably in the long run, the most economical supports.

Petticoat insulators are shown in Fig. 3. Insulators of this general type should be used for all exposed outdoor conductors on which a pressure exceeding, possibly, 25 volts is imposed, for the reason that ordinary porcelain knobs or cleats collect so much moisture on their surfaces during rain that their insulating values become very low. Such a film of moisture will greatly reduce the insulation resistance of an insulator, and in some cases will render the insulator practically useless. Where a petticoat insulator, similar to those of Fig. 3, is used, there will practically always be a dry surface under the petticoats at the bottom of the insulator, maintaining the insulation resistance of the insulator to a dependable value. The "umbrella" edges of an insulator of this type tend to prevent the moisture from collecting on the bottom surfaces and even if they do not keep the "petticoats" entirely dry, they are very effective in sustaining high insulation resistance.

Supports should be provided every 15 feet for conductors on exterior walls of buildings (Fig. 1). If the supports are placed very much farther apart than this there is a possibility of excessive sag in the wires and they may in some cases be deflected laterally and rest against the side of the building which supports them. Where downspouts or shutters are so located that they might interfere with conductors carried on the sides of buildings, additional brackets should be so placed as to prevent any possibility of such interference, as shown in Fig. 1.

Guard wires or irons should be provided where wires

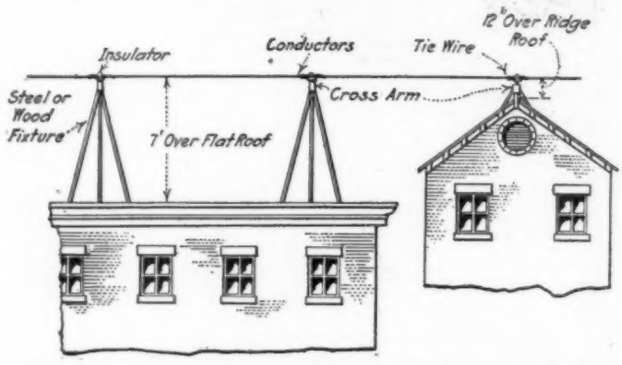


Fig. 2.—Line Wires Properly Supported on Roof Structures.

carrying pressures exceeding 600 volts are carried above low-tension wires in industrial-plant yards. Where such guards are used the possibility of the high-tension wires sagging or dropping and making contact with the low-tension conductors is eliminated.

Low-potential outside wires, unexposed to the weather, may be supported on porcelain knobs as shown in Fig. 4. That is, wires having impressed on them a voltage of 550 or less may be carried on knobs on porches or under eaves or where they are in some similar manner protected from the rain and moisture. Inasmuch as it is necessary to support such wires only one inch from the surface wired

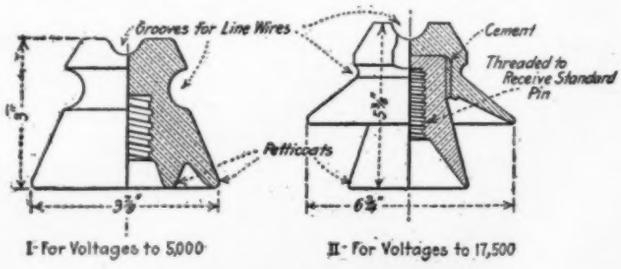


Fig. 3.—Porcelain Petticoat Insulators.

over, the supports should not be more than 4.5 feet apart. If the supports are farther apart than this there is a possibility of the conductors contacting with the surface on which they are carried.

Splices in wires should, if the splices are to be as strong unsoldered as the wires composing them, have at least five twists in the neck, as shown in Fig. 6. Then, soldering the splice further increases its strength and insures permanence

and ample electrical conductivity. To insulate a splice, it is wrapped as shown in Fig. 7 with insulating materials of the same thickness and of the same composition as those comprising the insulation on the wire in which the splice is made. For example, to insulate a splice in a rubber-insulated wire (Fig. 7) the splice is first wrapped with rubber tape to a thickness at least equal to that of the rubber insulation around the perfect wire. Then over this a wrapping of friction tape equivalent to the braid of the conductor is served. The friction-tape layer should be at least as thick as the braid serving on the perfect wire.

To insulate a splice in wire with weatherproof insulation the wire may be served with friction tape only, to a thickness of the weatherproof insulation on the perfect conductor.

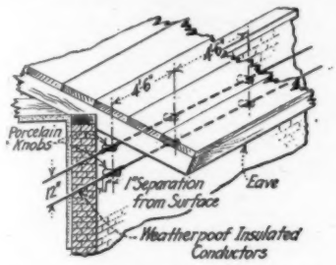


Fig. 4.—Conductors Protected From Weather.

A tap splice in a conductor is made as shown in Fig. 5. The bared end of the tap conductor is given a few long or "neck" twists around the main conductor and then the joint is finished off by serving four or five short end turns around the main conductor. The same rules and procedure are followed in insulating a tap splice as for a main-line splice like that of Fig. 7.

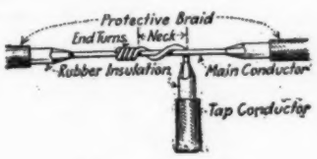


Fig. 5.—Tap Joint.

In splicing duplex or twin conductors the joints should be "staggered" as suggested in Fig. 8, so that there can be no possibility of the two joints contacting with each other and so that the bulge or enlargement that is made in insulating the two joints will not occur at one location. After a twin wire has been spliced by joining its two component wires as shown in Fig. 8 at *I* and *II*, and after each of these component splices has been insulated with the tape serving of the material of the insulation next to the wire, then the entire joint should be again served from *A* to *B* with friction tape, at least equivalent in thickness to the protective braid *C* on the twin wire.

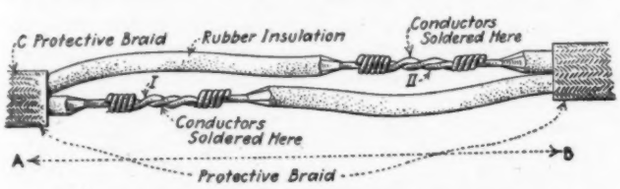


Fig. 8.—Joints in a Twin-Wire Splice Are Staggered.

Approved splicing devices are manufactured but have been applied more extensively for inside than for outside work. Figs. 9 and 10 show details of two types of the Dossert connector. All of these splicing devices are so designed that the two ends of the conductor which is to be joined are clamped, usually by a wedging action, by the device. Soldering is unnecessary. The electrical conductivity of a good joint of this type appears to be at least equal to that of a similar length of the wire itself. The mechanical strength of such a joint is usually at least equal to 75 per cent of that of the wires joined, and may be equal to the strength of the wires joined.

The Dossert connector for stranded wire is shown in Fig. 9. To make a joint with this connector the wire is first stripped and cleaned (*A*) for a distance 3/16 inch longer than the compression nut. Then (*B*) the compression nut and outside ring are slipped on and driven home (*C*) with a cup-shaped steel driver designed for the purpose. The outer strands are separated and the inner ring is pushed on over the central core (*D*) and driven home with another steel driver (*E*). Now the outside strands are formed back into position (*F*) and the nipple is screwed in place, which still further compresses the conductor, as shown in *G*.

A splicing device for solid conductors is shown in Fig. 10. With this device the inner parts are shaped to receive a double-conical split sleeve, which grips the wire with a chuck-like action. By heading over the end of the wire a trifle after it has been slipped within the split sleeve, an increase in mechanical strength is obtained.

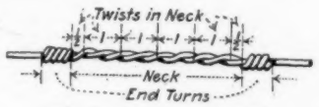


Fig. 6.—Bare Wire Joint.

Fig. 7.—Joint in Rubber-Covered Wire.

Mechanical splicing T's, crosses and terminal lugs (Fig. 11) can be purchased. They all involve constructional principles similar to those described in connection with Figs. 9 and 10.

A conduit system installed out of doors must be waterproof to prevent moisture from short-circuiting the conductors within the duct. To be waterproof a conduit system must be so arranged that water cannot enter it. To meet this requirement it is frequently necessary to use white lead or paint on the threads of the ducts and fittings before they are assembled, and to use rubber gaskets under the fitting covers. Where an entrance or service head fitting is used, as in Fig. 12, the wire openings of the fittings should always "look" down in such a way that the water cannot enter them.

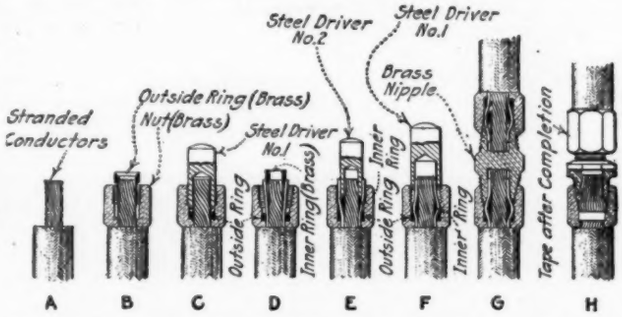


Fig. 9.—Making a Splice in Stranded Conductor With Dossert Connector.

Rubber-insulated wire must be used in making an entrance, as shown in Fig. 13. The wire outside of the building may have weatherproof insulation if it is properly supported away from members that tend to interfere, but between the last point of support outside of the building and the main cutout switch, rubber-insulated wire must be used. Such an entrance wire, where it passes through the wall to the interior of the building, is subjected to moisture, which renders desirable the use of the best possible insulation on it.

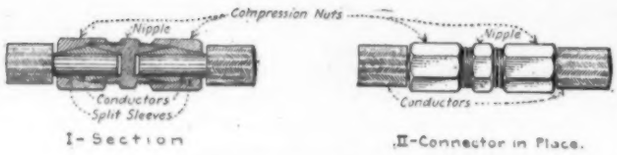


Fig. 10.—Dossert Connector for Solid Wire.

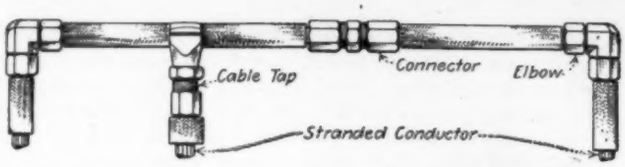


Fig. 11.—Applications of Approved Mechanical Splicing Devices.

Drip loops are bent in conductors just outside of the point where the conductors enter a building to prevent the entrance of moisture around the wire, as shown in Fig. 13. If rain does collect on the wire it will follow the wire down to the last point, *A*, and there fall off. None will enter the tube *T*.

Porcelain tubes are used to provide insulation where conductors enter buildings (Fig. 13). The tube should slant down from the inside so that condensed moisture will not flow through the tube to the inside of the building. The head of the tube should always be inside of the building to prevent the bushing from slipping out of position. In brick or masonry walls it is good practice to cement the entrance tube in position in the wall with plaster of paris or with Portland cement mortar, one-half by volume of sand and one-half of cement.

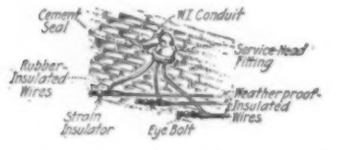


Fig. 12.—Conduit Service Entrance.

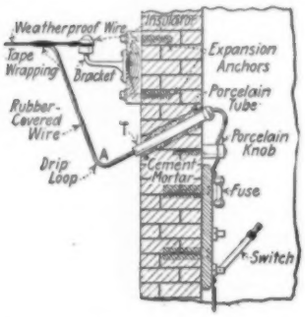


Fig. 13.—Weatherproof and Rubber-Covered Wire at Service Entrance.

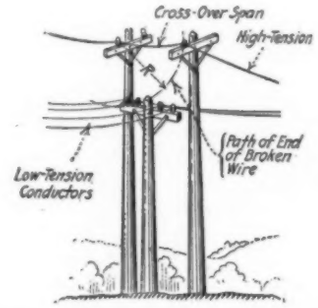


Fig. 15.—Showing How a Broken Cross-Over Span of a High-Tension Line May Foul With the Conductors of a Low-Tension Line Unless the High-Tension Poles at Crossing Are Sufficiently High.

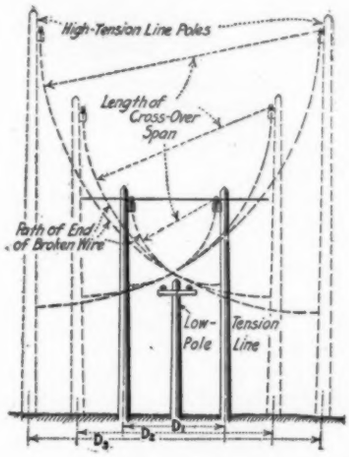


Fig. 16.—Height of High-Tension Poles Should Be Proportional to Distance Between Them.

Conduit service entrances are arranged substantially as suggested in Fig. 14. The approved service heads are provided with insulating outlet bushings (*B*) which separate the wires a safe distance, *D*, where they leave the fitting and prevent the abrasion of the insulation on the conductor by sharp metallic edges. As the illustration shows, the conduit entrance pipe must extend to the service cut-out, or if an entrance switch cabinet is required, the conduit must extend to and enter this cabinet. Since the cellar is now usually considered the most desirable location at which to enter a building, conduit entrances are very frequently installed, conduit providing the most satisfactory support for the conductors down the side of the building. Note that conduit entrances are permitted only for "low-potential" systems, involving pressures of 550 volts or less. The section of conduit used in making an entrance should be installed in accordance with the general requirements of the general rules for all conduit installations. The wire in the conduit must be rubber-insulated. Where the conduit passes through a masonry wall as at *M*, Fig. 14, the space between the outside of the conduit and the sides of the hole through the masonry should be sealed with Portland cement mortar, as shown around the tube in Fig. 13.

The height at which service wires should enter a building, either directly into the building or into an entrance conduit, is not specified by the National Electrical Code, but it is considered good practice to locate this entrance at least as high as the ceiling of the first floor. Where this is done there will be little danger of the service wires being interfered with by persons walking on the ground.

A method of making a service entrance by carrying the conduit down inside of a building is shown in Fig. 13. The weatherproof conductors in this case are dead-ended on strain insulators; the rubber-insulated conductors extend-

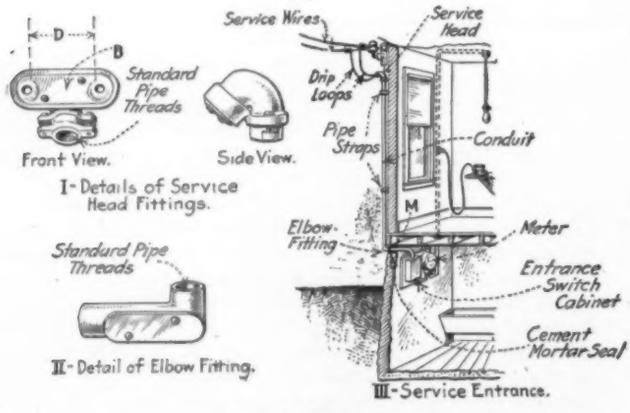


Fig. 14.—A Conduit Entrance.

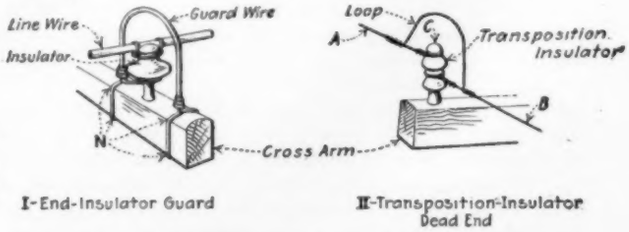


Fig. 17.—Insulators Arranged for High-Tension Crossings.

ing from the inside of the building tap on to the weather-proof-insulation wires.

An end insulator guard formed of heavy iron wire is shown in Fig. 17, *I*. The function of such a guard is to prevent the wire supported on the insulator within it from falling off of the cross-arm and on to the wires below in case the tie wire becomes broken. In placing a guard wire of this character on the cross-arm, the arm should be notched at points indicated by *N* to prevent the guard from slipping off. A guard of another type is shown in Fig. 19. These guards consist merely of pieces of strap-iron securely bolted to the cross-arm. Guard irons should always be of sufficient strength that there will be no possibility of their being displaced by the conductors they are placed to restrain.

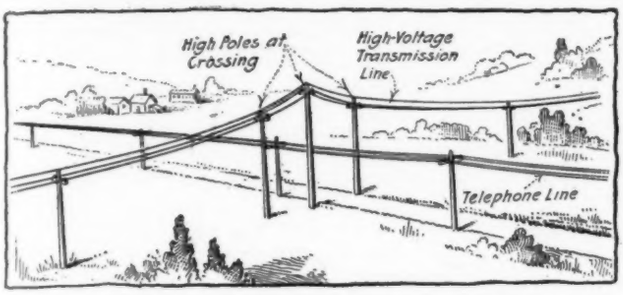


Fig. 18.—Crossing of High-Tension Transmission Line Over Telephone Line.

A transposition insulator may be used for dead-ending a line at a high-tension crossing as shown in Fig. 17, *II* Where the wires are dead-ended as shown, the possibility of a cross between the wires carried on the transposition insulator and those on cross-arms below is minimized. If, instead of a transposition insulator being used at *C*, an insulator of the ordinary type were employed, if the wire broke some place to the right of *B*, for instance, the weight of the cross-over span *A* might pull the whole section to the left of the break back through the tie wire on the insulator and it might fall down and make contact with the wires under *A*. Obviously, where the wires are dead-ended on a transposition insulator as shown, there is no likelihood of their pulling through the tie and becoming fouled with the conductors below the cross-over span *A*.

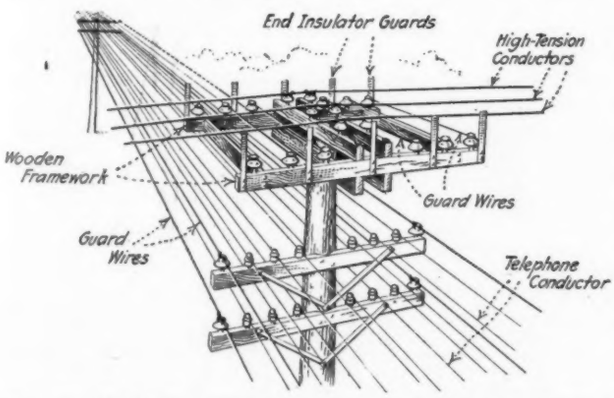


Fig. 19.—Joint-Pole Construction at a High-Tension Crossing.

Where a pole line carrying a pressure of 5,000 volts or above crosses another line it is desirable that the heights of the poles at the crossing be so selected that crosses between the two lines will be impossible. For example, as shown in Fig. 15, if the poles carrying the high-tension conductors, which should preferably be located above the low-tension conductors, are not sufficiently high and not sufficiently close to the low-tension line, a wire breaking in the cross-over span may drop down as shown and foul with the low-tension line. Fig. 16 indicates that if the high-tension poles are high enough it will be impossible for the high-tension wire of the cross-over span to fall down against the low-tension conductors. It is obvious from the illustration that the farther away from the low-tension line the high-tension poles are located, the higher the high-tension poles must be to satisfy this requirement. In fact, if the high-tension poles are located very far away from the low-tension line their height becomes excessive and their cost therefore exorbitant and out of all proportion to their value. It follows then that the two poles carrying the high-tension line over a low-tension line should be set as close as possible to the low-tension line.

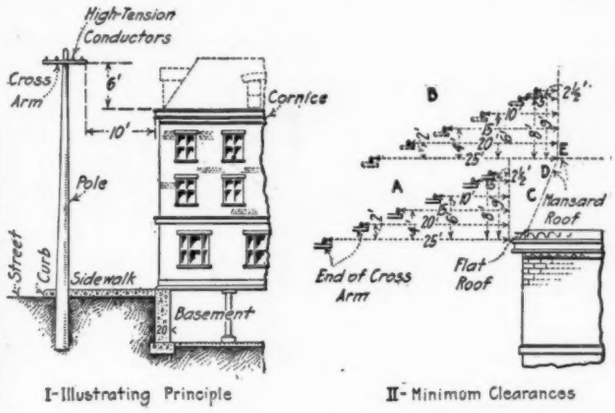


Fig. 20.—Minimum Allowable Clearances Between High-Tension Conductors and Buildings.

A good method of arranging a high-tension crossing is that pictured in Fig. 18, where one high-tension pole is set very close to, or possibly in between, the low-tension conductors. Then somewhat shorter high-tension poles can be located on either side of the low-tension line and a reasonable distance away from it. Note that end-insulator guards should be arranged on the high-tension poles adjacent to the high-tension crossing as shown in Fig. 17, and also the cross-over span for the low-tension conductors should be dead-ended on transposition insulators as shown in Fig. 17, or arranged in accordance with some other method that will provide equivalent protection.

Probably the most satisfactory method of making a cross-over on a high-tension line is that suggested in Fig. 19, wherein a joint pole is used.

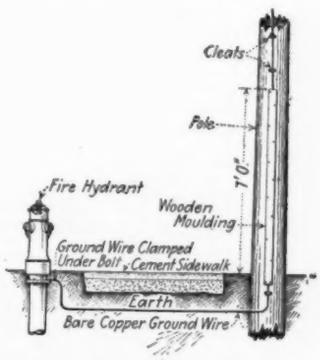


Fig. 21.—Secondary Grounded on Fire Hydrant.

A joint-pole crossing is shown in Fig. 19, which shows the high-tension conductors of a three-phase line crossing a telephone line. The construction carrying and associated with the high-tension conductors should be very strong. End insulator guards of the type shown in Fig. 17, *I*, or in Fig. 19, should be used to prevent the high-tension wires from slipping from the ends of the cross-arms. Although a three-foot spacing between the high and low-tension conductors is considered permissable in some cases, it is believed better practice to make this spacing at least five feet. In the illustration the guard wires on the telephone

cross-arms are supported on high-tension insulators about one foot from the telephone wires and about four inches above them. These guard wires should, preferably, be grounded. Inasmuch as the guard wires on the high-tension cross-arms of Fig. 19 lie directly over the guard wires on the lower cross-arms, it would be impossible for one of the high-tension wires that broke to contact with the telephone conductors.

The end-insulator guards extend about 8 inches above the horizontal plane of the high-tension conductors. Where

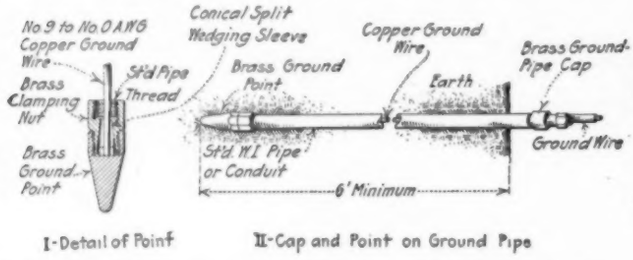


Fig. 22.—Special Fittings for Adapting Wrought-Iron Pipes for Use as Ground Pipes.

the guard wires are grounded it is not necessary to support them on high-tension insulators. Where metal poles are used for high-tension crossings, and they are probably preferable except that they are much more expensive, the metal pole should be thoroughly grounded.

When lines carrying pressures of 5,000 volts or above are carried near buildings they should be arranged in accordance with the requirements indicated in Fig. 20. The intent of these requirements is to so locate the high-tension conductors that they will not interfere with the fighting of a fire in the adjacent building. That is, they should be so located that the firemen in the street can play a stream of water on the burning structure without its striking the high-tension conductors. Where the building has a flat roof, as shown in the full lines in Fig. 20, the high-tension conductor nearest the building may be located in

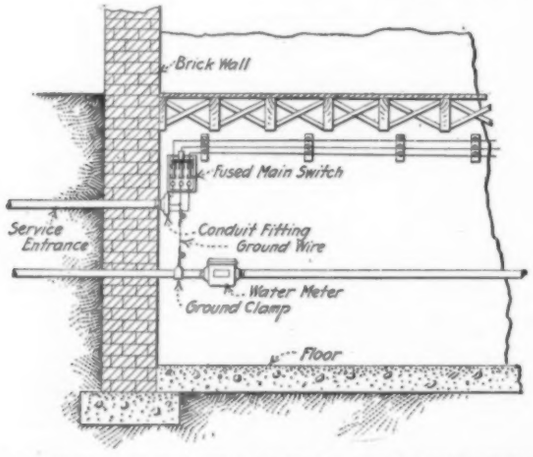


Fig. 23.—Method of Grounding an Underground-Service-Entrance Neutral.

accordance with the dimensions *A* given from the farthest extending point of the cornice. But if the building has a mansard roof, as indicated by the dotted lines, then it is obvious that conductors located as just above suggested would interfere with the operation of the firemen. Then, with a mansard roof or any roof that has a slight pitch, the conductors should be located in accordance with dimensions *B* measured, not from the actual cornice of the building, but from what in this case is equivalent to the cornice, that is, from some point, *C* or *D* of the roof, or preferably *E*, the top corner of the building.

Rubber-insulated copper ground wires should be used in or on buildings because in these locations maximum conductivity and high insulation are desirable so that a fire risk may be decreased to a minimum. Under extreme conditions ground wires may carry large currents. Iron ground wires cleated directly to the pole as shown in Fig. 21 have been found satisfactory in aerial construction.

No ground wire should ever be smaller than No. 6, A. W. G. (A. W. G. means American Wire Gauge, which is the same as the B. & S. Gauge). Wires smaller than No. 6

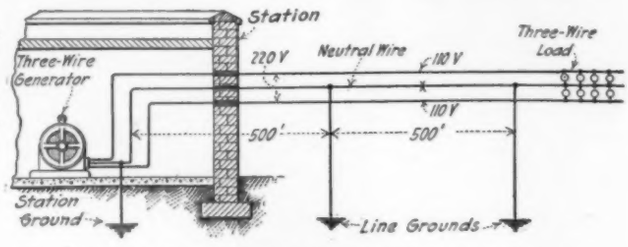


Fig. 24.—Grounds on Neutral Wire of a Three-Wire System.

should not be used because they are too weak mechanically to insure against their breakage in the exposed conditions in which they are frequently installed.

Ground wires for central stations, substations and on aerial pole lines are ordinarily of bare wire and are held to the walls of the building or to the pole with small pipe straps. Staples should not be used, because in driving them they are likely to nick the wire, rendering it liable to breakage. Furthermore, the staples may be driven in too far and therefore weaken the wire or shear it partially asunder. Heavy galvanized iron wire, preferably stranded wire like that used for guying, is often used for station and pole-line grounds. Sharp kinks, coils or bends should not be permitted in ground wires because these tend to increase the inductance of the ground conductor, which greatly increases the opposition of the conductor to high-frequency static discharges due to lightning or to surges. Fig. 21 shows a method of making a pole-line ground on a fire hydrant which has been successfully used in some localities.

Special points and caps for ground pipes may be purchased, whereby an ordinary length of pipe can be readily converted into a good ground pipe by screwing the point

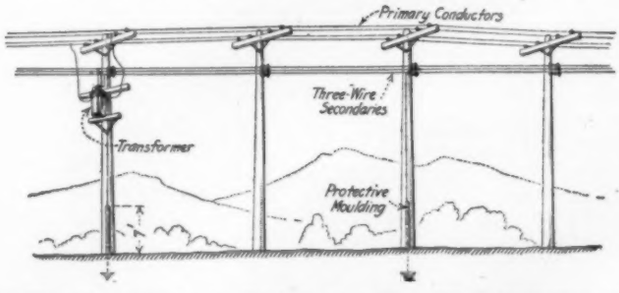


Fig. 25.—Grounds on Neutral of a Three-Wire Secondary at Transformer and Along Pole Line.

on its lower end and the cap on its upper end. With the Fargo point illustrated in Fig. 22 the ground wire is connected to the point by the wedge action of a conical split steel sleeve. It is carried down within the pipe to the point, as shown in the illustration. The ground wire is also connected to the pipe at its upper end where it passes through the brass ground cap. The provision of a point on the lower end of a pipe renders it easy to drive, and the cap at the upper end of the pipe prevents the entrance of moisture and also effects an electrical connection between the ground wire and the pipe. With some makes

of ground-pipe points the ground wire is not carried down within the pipe to the point but is merely connected to the pipe with a soldered or a mechanical joint at the cap.

The protection of ground wires against mechanical injury may be effected by running the ground wire in iron pipe or conduit, or in molding, as shown in Fig. 21. If the ground wire is protected with iron pipe or conduit and constitutes a ground for a lightning arrester, the wire should be electrically connected to the pipe by soldering it thereto or by driving in a metal wedge at the top. The reason for this is that if the wire is not electrically connected to the pipe the pipe increases the inductance of the wire, but if the pipe and wire are electrically connected together the pipe thus becomes part of the electrical path and this objection disappears.

The ground connections for central stations should connect to all grounded metal work within the station so that no portion of this grounded metal work can become charged to a higher potential above ground than the other portions. If the different components are not electrically connected, there is a possibility of one component attaining a higher potential than another, which might cause an electric arc between them, and a fire. Furthermore, there will be danger of an electric shock to an attendant who touches two conducting members at different potentials.

The ground connection to a neutral of an underground service is shown in Fig. 23. The ground wire is connected to the water pipe on the street side of the meter, so that if the meter be removed the ground will remain intact.

Ground connections should not be made to piping systems which have cement joints because the conductivity of such a piping system may be very low. In cases where the cement has fallen away from the joints in an old piping system of this character the resistance of one of the pipe joints may be so high that the joint practically constitutes an "open" in the circuit.

The neutral of a three-wire overhead distributing system should be grounded at least every 500 feet, as shown in Figs. 24 and 25. These conductors should be grounded for the same reasons that all secondary circuits of transformers should be grounded, namely, to tend to prevent a difference of potential greater than that for which the apparatus feeding from the conductors of the three-wire circuit were designed being impressed on them. For example, if a 110-220-volt three-wire system has its neutral grounded thoroughly there is practically no possibility of the voltage between any one of the wires of the three-wire system and ground exceeding 110 volts.

Contractor Secures Profitable Business by Working for Line Extensions.

A very interesting and no doubt unique method of stimulating wiring business and incidentally sales of supplies and appliances has been carried out with exceptional success by the Standard Electric & Equipment Company, of Red Wing, Minn. The policy of this company is to make a careful survey of the electrical possibilities of neighboring towns and villages, not already served by central stations, and canvass the residences to determine how many customers would be available in the event that electric service could be secured. Frequently, also, city or village authorities are approached in the matter of street lighting. With these data available the company enters into and negotiates with the Consumers Power Company, which maintains a network of transmission lines in the territory, and if the prospective business seems to warrant, definite arrangements are made for supplying energy. The Standard Electric & Equipment Company then secures house-wiring contracts from all those desiring service, and if street lighting is to be maintained, the necessary construction work is carried out, so that when the power company is ready to supply service all wiring is completed and no delays are encountered. It has also been the practice of this company to establish branch electrical stores in places where such wiring activities have been undertaken.

Within the past few months considerable business of this nature has been secured at Frontenac, Minn., and Goodhue, Minn. In the former case on the eve of receiving service the local newspaper contained the following account:

"The securing of electricity for this village was accomplished largely through the efforts of A. P. Taber, enterprising manager of the Standard Electric & Equipment Company. Some time ago he had several inquiries regarding the possibility of getting electricity for Frontenac, and he immediately set to work to see if it could be secured.

"By obtaining a certain number of citizens to promise to use the current and interesting Frontenac people in the installations of a number of street lights, Mr. Taber succeeded in getting the power company to branch a line to this village."

Similar notice appeared in the Goodhue papers relative to the obtaining of service through the efforts of the same organization. The account concluded somewhat as follows: "Arc lamps will be installed on the streets, while many of the stores and private residences will be supplied with electricity. Mr. Taber has already made a contract with 60 consumers to do their wiring and install fixtures. He will open up a branch store in the village within a few days."

While it may seem that work of this kind would naturally lie within the province of the central-station company, still it is frequently necessary for some citizens' committee or other interested body in approaching the utility company to have some concrete evidence as to the amount of prospective business before the extension of lines to such community would be justified. By anticipating this action on the part of prospective customers, Mr. Taber is able to secure for his company a large amount of profitable business which perhaps under the usual conditions would be divided among a number of concerns.

New Outdoor Substation Installed by Pacific Light & Power Corporation.

The Pacific Light & Power Corporation, Los Angeles, Cal., has installed the first outdoor substation on its system at Saticoy, to provide service for the Ventura County Power Company. The installation comprises three 1,000-kilovolt-ampere outdoor transformers with necessary switching equipment. Three steel-frame towers and one wood-frame tower each support a pole-top switch at the top and house an oil switch at the base. Power is delivered to the substation at 50,000 volts over a 56-mile transmission line leading from the Newhall switching station on the company's Kern River line and cut down to 15,000 volts for delivery to the Ventura County company.

This company, in turn, distributes the power over three lines to Oxnard, Ventura and Santa Paula; the cities of Fillmore and Piru also receive service over the Santa Paula line. This system has previously been supplied by the Southern California Edison Company, and operated at 33,000 volts; it is now being changed to 15,000 volts. The peak of the Ventura County Power Company ranges from 600 to 1,500 kilowatts.

Among the Contractors.

W. G. Heacock has been promoted to the position of general manager of the Electrical Maintenance Company, of Youngstown, O. Other changes which will take place in this organization will be the addition of Joseph Joseph, of Springfield, Ohio, as estimator, and Foster Sowers, formerly of the Dauphin Electrical Supplies Company, of Harrisburg, Pa., as assistant purchasing agent.

ELECTRICAL MERCHANDISING

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Store-Keeping for the Dealer in Electrical Goods

Kansas City (Mo.) Electric Shop Does Big Holiday Business.

The Kansas City (Mo.) Electric Light Company did by far the largest business in its history, in the Electric Shop, presided over by Miss Marie J. Russell, during the holiday season. Miss Russell provided facilities for shoppers, and for dispatching presents bought for others, such as were provided by the downtown stores, and the service was evidently appreciated. Articles were sent by parcel post and by express, to New York and California, and nearly every intermediate state. The purchases were wrapped by the employees of the shop, who also provided presentation cards, etc., and did up the bundles with tissue paper and holiday ribbon, in approved Christmas style. This feature was particularly appreciated.

C. F. Farley, manager of the commercial department, said that many items were entirely cleaned out of the stock, including irons, toasters, vacuum cleaners, and such articles, before the last shopping day had ended. The buying public evidently had plenty of money to spend, too; for the more expensive items were in heavy demand. The first and heaviest demand was for the higher priced electric lamps. The company had expanded its advertising for the holiday season, using quarter-page space frequently in all the local papers, picturing and emphasizing specific articles of electrical use as appropriate Christmas presents bound to be appreciated.

Bright Outlook in New England.

That business along electrical jobbing, wholesaling and contracting lines in New England is on the upgrade is evident from responses to a large number of inquiries as to trade conditions at Boston, Worcester, Springfield, Portland, Providence, Rutland and other important centers.

In an interview, the treasurer of one of the largest Boston jobbing houses said to a representative of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN: "Things are booming; the past month has been the best for a long time, and prospects for the new year are very rosy. Prosperity Week no doubt stimulated things considerably, but the good times were coming anyhow."

Another large dealer said: "Business in our line was generally dull from the beginning of the war until about October 1, when it began to show a decided increase. Since that, the improvement has been rapid, November with us having shown an increase over last year of between 35 and 40 per cent, and December, thus far, of over 50 per cent.

"Just how much of this was due to the 'Prosperity Week' campaign we are unable to estimate, but there is no question but that any such movement, with such wide publicity as was given this, tends to stimulate sales. The outlook for the coming year seems to us very bright."

Still another important Boston jobbing house and manufacturers' agent stated that business is much better than last year at this time, and that it is having more orders than it can take care of promptly. "There would have been plenty of business without the stimulus given by Electrical Prosperity Week," the head of this firm said; "but with its added effect, the result is a very full rush of business, with prospects for its continuance into the new year."

Dealers in appliances report an unusually large sale of domestic devices, such as cooking and heating apparatus, with a splendid run on electric ranges. The sale of table lamps has been phenomenal.

Contractors in the Boston territory are finding large jobs relatively scarce, owing to comparatively little large building construction, but old house wiring contracts have been abundant during the fall and early winter.

At Worcester, Mass., conditions in the electrical business are improving somewhat over a year ago, but, due to a strike in the metal trades in that city, conditions are perhaps not so good as elsewhere. Some of the dealers in supplies have not yet reaped large returns from Prosperity Week campaigning and advertising, but results later are confidently expected by those who participated.

At Providence, R. I., and Portland, Me., sales of appliances were phenomenal during and after Prosperity Week. In the former city the "Electric Shop," conducted by the Narragansett Electric Lighting Company, made record-breaking sales of household appliances, while at Portland the Cumberland County Power and Light Company had a large run on appliances, lamps, etc., during the holidays.

Reports from Rutland, Vt., and places in that vicinity indicate a very prosperous condition of trade. "This may be due in part to the usual pre-holiday rush," writes one contracting and merchandising concern, "but we have a great deal of work ahead, and the prospects are good for a continuance for the next six months, at least. Our business for the past four months has exceeded the business for the whole of the previous year."

Louisville Dealers Have Record Christmas Sales.

Christmas sales closed at Louisville with records of unprecedented business by the appliance dealers of the city and with a complete elimination of the stocks of electrical Christmas tree lighting fixtures. Most of the dealers provided more elaborately than usual for electrical tree lighting requirements, some of them re-ordering, it is stated, when the early shopping contingent began to make its preparations, while contractors, decorators and wiring men have been overwhelmed with orders. The fact that this was the best Christmas, from an electrical point of view, in the history of the city is attributed by the electrical fraternity to the special publicity obtained through the exhibits incident to Electrical Prosperity Week.

In this connection it may be noted that December ordinarily is a dull month in the house-wiring field, but this month has been an exceedingly busy one. A good part of the business has been a result of the 700 prospects listed by the Louisville Gas and Electric Company during Electrical Prosperity Week. Salesmen for the company have not nearly completed their rounds of the 700, not to mention the additional list of names of those who live in unwired houses but who have not asked for estimates of the cost of this improvement. It is also stated that the power business of the company during December, ordinarily the dullest month of the year, has been showing steady and satisfactory growth.

Business Hints for the Electrical Dealer

How a Store on a Transfer Corner Stimulated Sales—Effectiveness in Window Displays—Evils of Price-Cutting—Attention to Customers Important

By G. D. Crain, Jr.

"Come in and Wait."

A shrewd electrical dealer in an Ohio Valley city is taking advantage of the fact that few people like to stand shivering on a cold corner to wait for their car. His store is situated just a few doors above such a corner, and a good many persons are compelled to wait there several minutes at a time, a very disagreeable experience at this time of the year. Being of a warm-hearted and generous nature, the dealer has put a card in his window announcing, "Come In and Wait for Your Car," and a lot of those who formerly had to stand outside in the cold now make use of his warm and comfortable store as a waiting-room.

The advantage to him, of course, is more than the goodwill thus created—important as that is; but of those who take advantage of his hospitality, there are every day some who see items in his stock that they would like to take home, and they proceed to make a purchase. Altogether, he is managing to get a good deal of cash trade and to create some desirable new charge accounts by means of this open-door policy, which could have been justified without it.

The Proof of the Pudding.

If the proof of the pudding is in the eating, then the proof of the incubator may be said to be in the hatching.

Consequently the dealer who is selling electric incubators can demonstrate them no more effectively than by using them for their intended purpose, in public, where their operations may be seen.

There are plenty of dealers who have electric incubators in stock, but comparatively few are taking advantage of the splendid opportunity which is given to show them in a novel, effective and convincing way.

The value of motion in window-displays was commented on recently in this department, and there is no more attractive form of motion than life. By the time the chicks are breaking through their shells the dealer will have a display that will keep a crowd about his window, and one that will help to sell incubators, also.

It takes a certain amount of attention to keep the incubator going and to see that the little chicks after hatching are properly nourished. But as an advertisement the stunt will prove an excellent investment.

Looking Back.

Patrick Henry said on one memorable occasion that he had but one lamp by which his feet were guided, and that was the lamp of experience.

That is a good pointer for electrical contractors. If every member of the fraternity would take advantage of all the experience which he accumulates, so that each year he would be advanced that much further on his way to the topmost point, the progress that contracting as a whole would make would be considerably more than it is now.

Too many electrical construction men forget each job as soon as it is finished, from the business standpoint. They may have cost records covering it, but the lessons which they should have been made to point are not developed.

Right now, with electrical work probably light in most sections, is a good time for the contractor to get out his cost-sheets covering all of the jobs which he has handled during the past year, and figure the net profit on each one of them. There will be some, assuredly, where the returns were disappointing. Why? The answers to these will help to formulate a few features of business policy for 1916 that may help to keep the good ship afloat and riding high, instead of going to pieces on the reefs.

What Price-Cutting Means.

Price-cutting is a confession of weakness. It points to poor salesmanship, poor quality or poor demand. And poor demand is often interpreted by the public, rightly or wrongly, to connote indifferent value.

During the recent holidays most dealers found the demand for Christmas-tree lighting outfits ahead of the supply, as the result of the creative work which had been done by all interested in a safe celebration of the event, and consequently there was no incentive to cut prices. All of the outfits went at the standard figures, carrying a good profit for everybody concerned in handling them.

The public was thus given an object lesson as to the value of the merchandise; and since experience has taught purchasers that when a desirable article is in good demand, prices remain at the normal level, the announcement of reductions will carry the suggestion of lack of popularity, if not lack of quality.

The tendency of most people is to follow the crowd; to buy goods which have won popular favor. It is therefore just as simple to make sales at a profitable level, by spending money to create a demand, if need be, as it is to try to create a demand by the artificial and uncertain method of cutting the price.

Everybody connected with the electrical merchandise business ought to get it into his head that the main object of the game is not simply to sell, but to sell at a profit; and that profits will make it possible to do educational and creative work, which will develop additional sales and still more profits; while merely cutting prices to an unprofitable level is not even a guarantee of making sales, but simply assurance that no money will be made on whatever business happens to be done.

Talk over the price-cutting element with other members of the trade, and stir up sentiment in your community in favor of doing business at the normal, legitimate, profitable level of prices.

A Traveling Advertisement.

Many contractors use runabouts in their work, and find them exceedingly useful and convenient. It is noticeable that a great many have made use of them from an advertising standpoint by having their names and addresses painted, usually in gold letters, on the sides of the cars. This is good publicity, and as the contractor's car goes into all sorts of localities, where ordinary advertising may not reach, it is likely to turn up an occasional prospect who would not have got in touch with the concern otherwise. Some commercial houses go so far as to embellish their cars by painting them unusual colors, such as bright yellow, and endeavoring to attract special attention in this way. The effort which is being put forth generally to make the motor car play its part in advertising the business shows that many people have come to regard it as a traveling billboard, and therefore a desirable medium of publicity.

Be Interested in the Customer.

The salesman of a certain fixture store is accused by some of those who know him of being rather effeminate in his

manner. The accusation is unjust; for he is a manly fellow, and the only justification for the statement is that he is extremely dapper of dress, careful in his speech, and polite and courteous to customers, especially ladies. A good many of the latter come to the store, of course, and he is nearly always picked to wait on them. His success has been such as to show that the care with which he handles the details of his work is well worth while, and that it is appreciated by those who are in the market for fixtures.

He really puts himself in the place of the customer, and by trying to determine the sort of fixture which would be the most effective in a given location, he manages to develop enthusiasm and interest which puts him on the same side of the fence as the customer, as it were; in other words, instead of being an opponent of the purchaser, trying to force the latter into buying, he is working with her, and endeavoring to serve her interests first of all. In doing so, of course, he is at the same time serving the best interests of the house.

Goods sold under such conditions are always satisfactory, and there are few come-backs; while the aggressive salesman who dominates a customer into taking something that she doesn't want is likely to make a half-completed sale; its incompleteness due to lack of thorough satisfaction on the part of the customer.

In this connection it may be worth while to emphasize the contrast between the carefully dressed and, let us say, even foppish salesman who handles the trade in the fixture store referred to and some of those who perform similar offices in houses where contracting is handled along with the sale of a full line of electrical merchandise. In most instances many of those in the store are doing manual labor of one kind or another, handling material and getting their hands and their clothing more or less soiled. It goes without saying that a customer, particularly a woman, is not going to be impressed favorably by attention from a salesman whose unprepossessing appearance, while of course not his fault but that of his work, is not in accord with her ideas of propriety.

A concern which is handling both kinds of business, and which has a certain amount of work to be done which a salesman cannot do without detriment to his appearance, ought to reserve one or two men, depending on the amount of strictly retail business handled, for that purpose exclusively. They will then be able to devote more time to a study of the stock, as well as to details of their appearance, and customers will not be reminded when they come in to look at electrical goods, whether specialties or fixtures, that they are in a "shop," where clean hands and clean clothes are not absolutely necessary.

Co-operation Between Credit and Sales Departments Essential.

A salesman who has worked diligently to obtain a new account for his company, secured his first order, and later finds that the credit department has refused to accept the account naturally feels that he has some cause for complaint. Frequently considerable antagonism between sales and credit departments because of such occurrences has interfered seriously with the efficiency and success of an organization. At a meeting of electrical credit men recently held in Chicago, a sales manager of a prominent electrical jobbing house presented some pertinent suggestions for greater co-operation between the sales and credit departments.

Sales conferences, at which pertinent topics relative to commercial affairs are discussed, are important features of every well managed organization. It was suggested that at these meetings or conferences, which are usually held periodically, the credit department have an opportunity of discussing its problems with the salesmen, and gain, if possible, their co-operation. Salesmen perhaps, come in closer contact with the customers of a company than any other employees, and much valuable information for use by the credit department can be collected by salesmen without in any way jeopardizing their position with the customers or without interfering with their regular duties.

In regard to overdue accounts the salesman is also in an admirable position to assist the credit department by affording the human contact between the office and the customer. In one organization, where this co-operation was in vogue, many trivial differences were settled by the salesmen, and accounts upon which payment was delayed because of these differences, were promtply settled. As a further means of prompting co-operation it was suggested that a prize be offered each year to the salesman in whose territory the least credit losses were encountered.

Merchandising Electrical Appliances in New York.

Although it does not engage actively in the sale of electrical appliances, the New York Edison Company, New York, N. Y., co-operates on a comprehensive scale with the dealers and electrical merchants of that city. A permanent feature of this co-operative effort is the publication each month in the New York Edison Company's house organ of a complete directory of electrical manufacturers, agents and dealers who handle electrical appliances. The elaborate show rooms maintained by the Edison Company are simply for the convenience of its customers, as all prospective purchasers are referred to the dealer in their neighborhood in case purchases are to be made.

With the December issue of the company's house organ an attractive folder was sent to all customers illustrating many domestic electric appliances suitable for Christmas gifts. In addition to giving the range of prices for the articles illustrated the company included data as to the cost of operation. For example, an electric toaster was stated to cost 0.4 cent per hour for energy, an electric percolator 3.75 cents per hour, an electric iron 4.5 cents per hour and a vacuum cleaner 0.1 cent per hour, etc.

India Offers United States Electrical Trade Opportunities.

A recent issue of the *Indian Textile Journal,* published at Bombay, India, reviews, to a considerable extent, some of the industrial difficulties which have fallen upon the country due to the almost complete stoppage of supplies from Germany, Austria and Belgium. While hardware, glass, chinaware, furniture, toys and chemicals are among those things which India is now greatly lacking, it is understood that there is a wide open market for electrical materials owing to the shortage in the supply from other countries. John Wallau, editor of the *Indian Textile Journal,* makes the statement that Japan seems to be the only country that is trying to benefit by the present situation, but that there seems to be a very good opening for many branches of American manufacture.

Stimulus Given Merchandise Sales in Springfield.

A conspicuous example of stimulated interest in electrical things, for which Electrical Prosperity Week was largely responsible, is found in Springfield, Mass., where the department stores, hardware dealers, and other allied concerns featured the electrical device and apparatus carried for sale. This continued not only through Prosperity Week, but was extended into the weeks following, with special reference to Christmas purchases.

The local newspapers of December 12 contained many advertising columns featuring things electrical.

PUBLIC SERVICE COMMISSIONS

A Resume of Important Decisions of the Week Affecting Electric Utilities

ARIZONA.

Uniform Classification of Accounts. The Arizona Corporation Commission has issued an order requiring all electric utilities in the state to file on or before March 1, 1916, an annual statement for the year ending December 31, 1915.

Pacific Gas & Electric Company. The Commission has authorized a bond issue of $50,000, the proceeds derived from the sale to reimburse the treasury for money expended therefrom in extensions, additions and improvements.

CALIFORNIA.

Great Western Power Company. The application of the Great Western Power Company for a certificate of public convenience and necessity permitting the exercise of certain franchise rights in the county of Contra Costa, was denied. The right which the company desired to exercise was the construction of a transmission line a distance of approximately 2,500 feet, to enable it to serve the plant of the Western Grain & Sugar Products Company, a company using a considerable amount of energy. This company is at present being served by the Pacific Gas & Electric Company, at the same rate as is provided for in the contract between the sugar company and applicant, and to construct the extension proposed would be merely to duplicate the existing facilities of the Pacific Company, inasmuch as the company does not hold itself out as willing to serve the general public of this locality, but merely desires to secure certain of the larger and more profitable consumers.

NEW YORK—First District.

George V. S. Williams, a member of the Public Service Commission for the First District, has forwarded his resignation as a Public Service Commissioner to Governor Whitman. Mr. Williams has served on the Commission since 1912, when he was appointed by Governor Dix. His resignation is to take effect January 31, 1916, when he intends to resume the practice of law. Governor Whitman has as yet taken no action upon the resignation.

OHIO.

The Alliance Gas & Power Company, Alliance, O., has appealed an ordinance passed by the city council last August to the Ohio Public Utilities Commission for adjustment. The ordinance provides for a service rate of 6 cents per kilowatt-hour for light. The company claims that no profit can be made at this rate, and asks that an increase be permitted.

VERMONT.

Vermont Power & Manufacturing Company. Upon the complaint of citizens of the town of St. Albans that certain increases in rates for electricity are exorbitant and unreasonable, the Commission has investigated the rates of the Vermont Power & Manufacturing Company. The petition specifically alleges that:

(1) The proposed new controller rate increases the price of current to consumers using controllers more than 140 per cent.

(2) The proposed new meter rate, "Class A Residences," establishes a basis upon which consumers in exactly the same class and condition will have to pay unequal rates for current consumed. For instance, one consumer who has in his residence say 50 light sockets, and consumes in a month say 50 kilowatt-hours, would be charged for that amount about 42 per cent more than his neighbor who consumed the same amount of current, but had in his house only 20 light sockets. The effect of the new rate would be thus unequal and discriminatory in practically all cases, some more and some less.

(3) The "Class B Commercial" rate proposed would be unjust and discriminatory for the same or similar reasons.

(4) Unless the consumer under the last named class accepts the unjust method proposed upon which to base the charges against him, he is required to stand the extra expense of a "demand indicator" to partially correct such unjust basis.

(5) The "Class C Commercial" rate and basis proposed are discriminatory against other consumers under practically identical or similar conditions.

(6) In "Class F General" the exclusion of power used for "the operation of dynamos or generators for electric lighting purposes" is discriminatory and monopolistic.

At the hearing the petitioners abandoned any claim that the company is receiving any larger gross revenue under the present rates than it is justly and reasonably entitled to, but still contended that the rates complained of are unequal and discriminatory.

As to Class A Residence, the Class B Commercial and the Class C rates, the petitioners claim that the "element of demand" ought not to be recognized, and that as an alternative for the present Class A, Class B and Class C rates single rates at an equalized price would be preferable. They say, however, that the small advantage that would accrue from this to some consumers would be fully counterbalanced by the loss of the opportunity now afforded to consumers to use current in excess of the "demand" at a secondary rate of six cents per kilowatt-hour, which is no doubt considerably lower than any single uniform rate that could be fixed in justice to the petitionee would be. The petitioners finally urge that the demand be computed upon a basis of leaving out inactive fixtures, or by using a percentage of the connected load instead of the whole.

The Commission, in its opinion, says: "The Commission does not look with favor upon the suggestion that a flat rate is preferable to the rates in question. The element of preparedness to serve on the part of the company in computing electric rates is now well recognized.

"An analysis of total station expense of seventy of the smaller central stations in the eastern states, which was made by E. S. Doane, and is contained in a paper read before the National Electric Light Association, shows the relative proportion of cost which depends upon the number of kilowatt-hours generated to be 37.9 per cent, the relative proportion of cost which depends upon the number of consumers connected and served to be 11.3 per cent, and the relative proportion of cost which depends upon the capacity of the station, which in turn depends upon the 'demand,' to be 50.8 per cent.

"That part of cost dependent upon station capacity is largely proportionate to the capacity of the aggregate in-

stallation of consumers. The revenue to meet this part of cost must be and is derived from the sale of current to consumers. The nearer to capacity a consumer approaches in an even and constant use in his particular installation the greater is his proportionate contribution to meeting this portion of cost which is dependent upon station capacity, and the nearer all the consumers approach this character of use, the less is the cost dependent upon station capacity per kilowatt-hour of production. Consequently a consumer's ratio of current consumption to the capacity of his installation should determine whether he shall receive a relatively low rate or not. A flat rate would in no wise distribute this portion of cost which depends upon station capacity equably among the consumers, unless the consumption of current were nearly equal among them, which is not the fact in the present case.

"Some form of demand rate is the most satisfactory type, and the Wright demand rate, of which Classes A, B and C rates in question are examples, is the most satisfactory rate for small users and for the lighting company whose customers are mostly of that class. The petitioners suggest in their brief a computation of consumers' demand upon a portion or percentage of installation. Any such change in computing demand, if substantial, would result in reduction of revenue, unless the present primary and secondary rates for current were raised. The petitioners admitted that the petitionee is not receiving more than an adequate revenue. The Commission is of the opinion that these primary and secondary rates for current should not be increased. Further, we are of the opinion that these Class A, B and C rates are equal and not discriminatory as between customers, when the elements above set forth are considered.

"The form of the annual quantity discount made on Class B Commercial business is not warranted. The discount is regressive and should be changed. The Class C Commercial rate is approved, for the reasons above stated, with the exception of the quantity discount therein provided, which is the same as that discount in the Class B rate, and is subject to the same infirmity."

The company has a rate called "Class E General," which is not specifically mentioned in the petition, but is criticised in the petitioners' brief. This rate is five cents per kilowatt-hour for current for the operation of heating and cooking devices, subject to cash and quantity discounts, provided the consumer also uses electricity for other service. There is a minimum charge of 50 cents per month for each meter installed or service connected, if current is used for heating and cooking purposes only. The petitioners claim this rate should be extended to cover such other devices as are in use for domestic and other small power purposes.

The Comission held that there is an adequate industrial power rate provided by the Class F General rate above referred to. An extension of the Class E General rate to cover the use of current for all electrical devices used exclusively in the ordinary housekeeping of the consumer, but not to include the use of current for industrial motor service, charging storage batteries, electric furnaces and electrolytic service, and the operation of dynamos and generators for lighting purposes, should be permitted.

The petitioners complain that the Class F General rate should be extended to permit the consumer to run a motor in "operating a generator for lighting purposes" and that the exclusion of the operation of dynamos and generators for electric lighting purposes should be stricken from the rate. The Commission says: "The company has an adequate lighting rate, and to permit a consumer to curtail the company's sale of current for lighting by converting the current sold to lighting purposes, would introduce an anomalous situation which this Commission does not care to endorse.

"Without regard to the petitioners' admissions as to the revenue of the petitionee, Classes A, B, C, E and F rates are high enough. We will not look with favor upon any increase either in amount or by change of form of any of these rates by the company or any successor to its business, unless new circumstances arising in the future would warrant it."

It was ordered that the company shall so modify its tariff as to Class E General and Class E limited rates to include therein the sale of electrical energy for the operation of appliances ordinarily used in domestic housekeeping, excluding, however, industrial motor service, charging storage batteries, electric furnaces and electrolytic service and the operation of dynamos or generators for electric lighting purposes, and to file such modification of tariff with the Commission.

WASHINGTON.

Pacific Power & Light Company. Drastic reduction in the rates charged for residential lighting and power for irrigation, by the Pacific Power & Light Company, operating in 30 cities and towns throughout Eastern Washington, has been ordered by the State Public Service Commission. The new rates for lighting per kilowatt-hour follow: North Yakima and Walla Walla, 8.5 cents; Pasco, Kennewick, Toppenish, Prosser, Dayton, Sunnyside, and Pomeroy, 10 cents; Granger, Grandview, Wapato, Mabton, Richland, Witsburg, and Zillah, 11 cents; remaining nine small communities, 12 cents. Recent rates ranged from 10 cents at North Yakima and Walla Walla to 15 cents at smaller towns. The Commission finds that the new rates on present consumption will give the company a return of 5.7 per cent, and that increased sales resulting from the reduction will bring this return to 6 per cent. All of the above rates are based on the first 60 hours used; for the second 60 hours, rates for many of the towns is 8.80 cents and for any amount over 120 hours, 6.60 cents. The Commission provides that rates for irrigation power shall be computed "on the active load, rather than the connected load," in future. This, according to the Commission, will alleviate the burden on the consumer to a great extent. The quoted rates for irrigation power remain the same. The Commission finds that the company has been furnishing service to a large number of users, including railway companies, at reduced rates, and has ordered this practice stopped, claiming it is discrimination which is in violation of the utilities law.

Missouri Utilities Association Appoints Committee on Rules.

At a recent meeting of the Missouri Association of Public Utilities, held at St. Louis, a committee was appointed to confer with the Public Service Commission of Missouri in regard to a case scheduled for hearing in reference to adopting uniform rules. The committee will obtain complete information from the National Electric Light Association and from the Bureau of Standards regarding this subject. The committee is comprised of J. D. Dowles, of Springfield; F. C. Pratt, of Joplin; John Fay, of St. Louis; S. C. Bronson, of Ozark, and A. N. Richardson, of Kansas City.

Electric Railways.

At the Institution of Civil Engineers in London on December 14, 1915, the James Forrest lecture, which dealt with the subject of "Electric Railways," was contributed by H. M. Hobart of the General Electric Company, Schenectady, N. Y., and was read by J. A. F. Aspinall, manager of the Lancashire and Yorkshire Railway, which has electrified part of its system.

NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

MECHANICAL AND ELECTRICAL EQUIPMENT OF NEW LAKE FREIGHT STEAMSHIP NEVADA.

Exceptionally Complete Electric Kitchen.

Designed for heavy all-the-year around service, the new steel steamship *Nevada*, of the Goodrich Transit Company, is very strongly built and is adapted to battle with ice floes during the winter on Lake Michigan. It is a freight boat, but has accommodations and fittings that are lacking on many passenger steamers, being thoroughly modern in its equipment as is evidenced by its very complete electrical installation. The *Nevada* is 238 feet overall and 42 feet beam, and can carry 1,500 tons of cargo. The boat will ply between Chicago, Milwaukee and other Lake Michigan ports.

Strongly built throughout, the prow is especially braced and reinforced, and the forward plating is of steel plates one inch thick. The cruiser stern is also of some advantage in handling the boat when it is necessary to back up to buck the ice. Water-tight compartments are provided; also a launch and the necessary complement of small boats, life belts, etc.

Triple-expansion condensing engines, developing 1,600 to 1,700 horsepower and turning the propeller shaft at from 105 to 118 revolutions per minute, drive the ship at a normal speed of about 16 miles an hour. Two Scotch marine boilers, each fired by three furnaces, supply steam at 180 pounds pressure to the engines.

A steam steering gear is installed, and there is a four-ton steam derrick on the main deck aft. Here also is a steam mooring engine which replaces the familiar windlass in winding the hawsers by which the boat is secured to the dock. Forward, the main windlass is steam-driven and is used for hoisting the anchor, as well as a winding engine. There are three 4,000-pound hydraulic elevators on the boat. These are used for handling cargo, two being installed in forward hatches and one aft.

The boat is steam-heated and most comfortably fitted up, although designed to carry no passengers. Artificial refrigeration is provided, and there is also an ice-making machine.

One commendable feature of the *Nevada* is the comfortable, sanitary living quarters provided for officers and men. It is probable that few lake boats have forecastles that are as large, light, airy and comfortable to sleep in.

Aids to navigation are of the most modern type. An automatic mechanism, electrically connected with the compass, keeps a record of the course steered. There is a McNab direction and revolution indicator and a thoroughly equipped ship's telegraph connecting the pilot house and the bridge with the engine room. A complete telephone system has been installed by the Western Electric Company, and there are also other signaling systems.

There are two 18-inch electric searchlights—one mounted on the pilot house and the other on the spar deck, aft.

Fire protection has been carefully looked after, the Aero automatic fire-alarm system being installed throughout the boat. In this system fine copper tubing is used, so designed that a comparatively slight rise in the temperature will expand the air in the tubing sufficiently to cause an alarm to be sounded in several places about the boat. The turbine-driven fire pump has a capacity of 1,200 gallons a minute. Compressed air is supplied for the operation of tools and blowers.

Electricity is supplied by three 125-volt direct-current General Electric dynamos, each directly coupled to a small Curtis steam turbine. Two of these units are rated at 35 kilowatts each and one at 15 kilowatts. The electric lighting fixtures are modern, and a number of electric fans and other electrical conveniences are provided.

Food for a ship's company of about 90 persons is cooked in an electric kitchen. The principal electric cooking appliances in the kitchen consist of a large electric range, an electric broiler and an electric bake oven. The range itself is large eough to do the cooking for about 125 persons. It is of the standard hotel type, made by the General Electric Company, which furnished all of the electric cooking equipment. The range consists of two roasting ovens and a top cooking surface, the latter being divided into eight rectangular hot plates. The dimensions of the cooking surface are 37 by 24 inches. Each oven has inside dimensions of 18 by 28 by 16 inches. The roasting ovens are ventilated by flues, and the range presents much the appearance of an ordinary hotel range using coal or other fuel.

With a maximum demand of about 19 kilowatts, the probable average demand of the range is about 14 kilowatts. The hot plates on the side of the cooking surface toward the front operate at high temperatures for rapid work, while the rear hot plates are used at lower temperatures for continuous boiling, etc. The electric heating units in the range are protected by fuses, the circuits operating the heating elements being controlled by knife switches mounted on slate panels on the top of the range. The main circuit is closed through a double-pole circuit-breaker.

The electric broiler has a capacity for cooking about 70 pounds of meat an hour. The broiling area, about 14 by 20 inches, is operated on a maximum of five kilowatts, and the electrically supplied heat can be reduced to that of one-half kilowatt for the purpose of keeping meats hot. The heating unit is located at the top of the broiling chamber, and is controlled by a double-pole switch. The gridiron on which the meat rests is supported below the electric heating unit on a movable frame, so that the distance between the heating unit and the meat may be regulated.

In the electric bake oven the maximum load is about 6 kilowatts. This oven has a capacity of about 60 loaves of bread. It is arranged for three heats, and its construction is similar to that of the ordinary gas-heated ovens. The electric heating elements are located in the base, and the air is circulated through flues on each side of the oven and on each shelf, giving an even distribution of baking. The oven is constructed of heavy galvanized sheet iron, supported on an angle-iron frame, and it has double walls with heat insulation. Knife switches, conveniently mounted on the wall nearby, control the heating units.

Operating the electric range, broiler and bake oven to maximum capacity at the same time would require 30 kilo-

watts of energy. The advantages claimed for electric cooking equipment on steamboats, as in hotels and restaurants, are: saving in floor space; elimination of handling of fuels, compared with wood, coal or charcoal; conservation of the heat in the range itself, and not heating the kitchen excessively; greater cleanliness than other methods; saving in time, as the electrical apparatus is particularly adapted to high-temperature operations, such as broiling, frying, roasting, baking, etc., all of which are accomplished rapidly by the use of electricity with more ease and comfort than are possible by other methods. The objectionable features of smoke, gas and excess heating are entirely eliminated.

Reimers Regulator Flatiron.

In all laundry work, experience has shown that it is very desirable to provide a different degree of heat when working on very light fabrics than when working on dense and heavy materials. In the ordinary electric flatirons it is customary to adjust the amount of heat provided by cutting off the current when the iron becomes too hot, the stored heat then taking care of the work until the temperature has run down to a point requiring reclosing of the circuit. As this operation means stoppage of the work in order to open and close the circuit, time is wasted and the temperature is by no means uniform nor perfectly adjusted for the work in hand.

To meet the need for perfect adjustment, the Reimers Manufacturing Company, 130 Church Street, New York City, has recently placed on the market a new model of its regulator electric iron. As shown in the accompanying view, this iron has a very convenient adjusting switch, the handle of which projects just above the body. By means of this it is possible to change the current consumption of the iron through four different heats, so that at all times there is provided just that amount of heat that is needed by the work. This iron is a 6.5-pound appliance and although designed primarily for the use of garment factories and laundries, it has been found very satisfactory in the ordinary household.

Regulator Electric Iron.

This iron is only one of several types made by this company, but the success of this new model has been so pronounced that although it has not yet been exploited to any extent, a very large number of these irons are in use and giving excellent satisfaction.

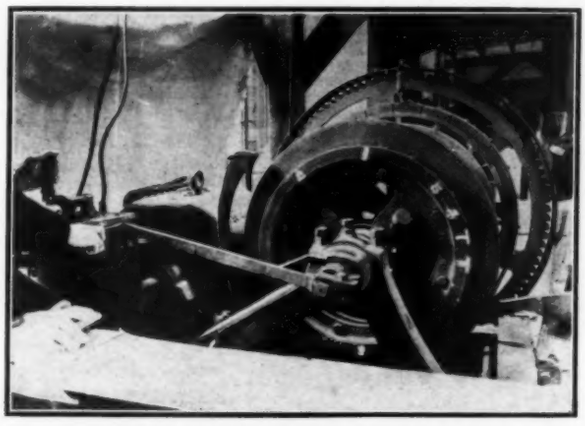
Electric Drive of Contractors' Machinery.

The electric motor is being used more extensively every year for operating contractors' machinery, such as hoists, concrete mixers, pumps, air compressors, shovels, etc. The main reason for this growing popularity is simply that electric drive is more economical and convenient than steam, provided, of course, electric current is available, as it usually is in the neighborhood of built-up communities.

In the first place, the motor does away with the steam engine and the boiler. This means that there is no fuel or water to handle, no licensed engineer is required, and smoke and sparks are eliminated. One man only is required to handle a motor-driven machine, and he need not be an experienced engineer, as any workman can learn to handle a motor in a short time. A single handle controls all operations, starting, stopping, reversing and changing the speed. There are no stand-by losses, either. The motor uses power only when actually running.

Having no boiler, the machine is lighter and more compact that a steam-driven machine, and hence is more readily moved and placed in position. On account of its compactness, a motor-driven hoist may be placed where it will not interfere with traffic. The absence of fire and sparks makes it absolutely safe, even though it is crowded under the scaffolding. Cables located overhead out of the way take the place of awkward, leaking pipes, and there is nothing to freeze in cold weather. Delays while "steaming up" are done away with. The machine is always ready to start when the whistle blows.

Another point in favor of the motor is its simplicity and reliability. Its motion is wholly rotary; there are no reciprocating parts, and only two bearings, and these are self-oiling. In consequence, it needs little attention, and has a very long, useful life. The motor is also very quiet in operation, a matter of importance in doing city work.



Electrically Driven Hoist Used by Contractor.

The Westinghouse Electric & Manufacturing Company has studied this field very carefully, and builds a line of motors specially adapted for contractors' use. Their special features are their ruggedness and strength to stand the very hardest usage to which they are subjected.

Motors for hoists, concrete mixers, and shovels, may be totally inclosed. They are designed to produce considerable power within limited dimensions, especally in starting, where the demand for power is greatest. The speed is adjustable, and the motor can be stopped and reversed almost instantly without injury.

The extensive use of electric power in such operations as the building of the Panama Canal and the Catskill Aqueduct proves its desirability for large work, while a careful consideration of the advantages enumerated above makes it evident that it is superior to any other form of power for the small job, as well as the large one.

The motor-driven hoist shown in the accompanying illustration, the photograph of which was secured with difficulty, owing to the limited space, is located on the sidewalk at Fifth Avenue and Fourteenth Street, New York City, where it is used in connection with repairs to a building. This is typical of the many uses to which the electric motor hoist is applicable where the steam hoist would be unsuitable or at least very objectionable.

The Nokolyd Motor-Car Rear Signal.

The expeditious handling of dense automobile traffic in our large cities requires skillful operation of the cars and thorough co-operation between the drivers themselves as well as with the traffic officers. To avoid collisions on stopping or turning it is found requires a simple and reliable signal device. Such is being shown at the New York Automobile Show.

It is one of the most ingenious of all the automobile devices tested by the Safety First Society. It is, at the same time, one of the simplest, from the installation point of view, for there is no connection between the signal itself, which is located at the back of the car, and the controlling apparatus, on the steering wheel, other than three slender wires.

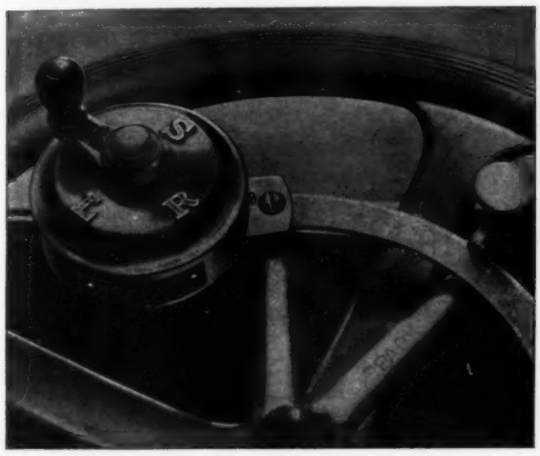


Fig. 1.—Controller on Steering Wheel.

The device is electrical. It is operated from the storage battery, which forms part of the equipment of every automobile, or it may be operated by ordinary dry cells. As each signal is set, the current is automatically cut off, from which it becomes apparent that the current consumption is very low.

Fig. 2.—Rear Signal With One of the Warning Signs.

The controlling mechanism Fig. 1, is fastened to the steering wheel, and within it is an automatic stop mechanism, which operates in similar manner to a Postal Telegraph call box. The dustproof box, at the rear of the car, has a square member inside with four faces, marked STOP, RIGHT, LEFT, and the fourth space is plain white, and shows when the controlling lever is in neutral position. When the controlling lever is turned to "S", "L", "R", or "O", the square member in the rear is turned by an electromagnetic device until the face—Stop, Left, Right, or blank, corresponds to the letters on the controller.

The Stop signal shows white letters on a red background, the Right signal shows black letters on an orange background; the Left signal shows white letters on a green background. Both the right and left signals are supplemented by arrows, showing the direction.

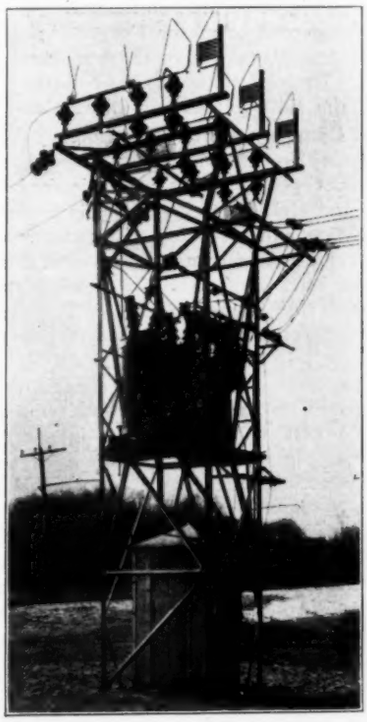
By day the signal is plainly visible for a long distance, and by night it is automatically illuminated. A tiny bell rings when the signal is given, which informs the operator that the instrument has registered correctly.

This signal is known as the Nokolyd Signal and is manufactured by the Nokolyd Signal Company, 40 West Thirteenth Street, New York City.

Modern Outdoor Substations.

Progress in high-tension distribution made during the past four years has demonstrated the fact that it is no longer a question of whether outdoor substations should be used, but rather how many can be advantageously installed in a given territory. The outdoor substation now occupies a very definite place in high-tension distribution, and the general tendency is to employ the steel-tower type.

The substation illustrated herewith occupies a ground space of 6 feet by 6 feet, and is designed for a maximum capacity of 150 kilowatts at 33,000 volts. The three-pole switch is controlled by a locking-type handle, which can be located either near the ground or about 12 feet above.



Three-Phase, 150-Kilowatt, 33,000-Volt, Steel-tower Substation.

A unique feature of this construction is in the use of a steel housing 4 feet by 4 feet by 7 feet at the base of the tower. In this house are located the various metering equipments, distribution panels, feeder regulators, etcetera, space also being provided for storage of spare parts. This equipment, which is shipped complete ready for installation, is manufactured by the Delta-Star Electric Company, Chicago, Ill.

INDUSTRY ACTIVITIES

Thomas M. Harrigan, Woodstock, Vt., manufacturer of splicing links and insulators for pull-socket chains, is distributing an attractive desk calendar for 1916.

Benjamin Electric Manufacturing Company, 128 South Sangamon Street, Chicago, has issued a new discount sheet applying to catalog B-21, which was recently issued. The new prices became effective January 3 and were necessitated by increases in cost of material and labor.

Holophane Glass Company has opened temporary headquarters at 340 Madison Avenue, New York City. From this office the company will resume the sale of Holophane prismatic glassware, which in recent years has been handled exclusively by the Holophane Works of General Electric Company. The company has been reorganized, with Otis A. Mygatt as president and C. Franck as sales manager. It is expected to place on the market in the near future some new types of Holophane glassware.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued several illustrated leaflets on new types of railway motors. Leaflet 3833 describes Westinghouse motor No. 306-V, which is rated at 67 horsepower, as a commutating-pole motor. Leaflet 3765 describes motor No. 307-V; this is a 55-horsepower commutating-pole motor. Leaflet 3837 describes motor No. 333-V; this motor is a 120-horsepower box-frame commutating-pole machine. Leaflet 3835 is devoted to motor No. 547-A; this motor is rated at 80 horsepower and is of the box-frame commutating-pole type. Each of these types of motor is described in detail with the aid of numerous illustrations.

The Bristol Company, Waterbury, Conn., has issued preliminary bulletin No. 231, which is devoted to Bristol's recording frequency-meter; this meter is made with both round charts and strip-type charts and is designed for the accurate indication and recording of frequency of alternating-current circuits. The company has also issued bulletin No. 206, which illustrates and briefly describes a number of Bristol's recording electric instruments; among these is the recording millivoltmeter, shunt ammeter, recording wattmeter, polyphase wattmeter, voltmeter, etc. The company has also issued bulletin No. 211, briefly dealing with the strip-chart type of recording instruments, which are made for recording a variety of electrical properties, as well as for temperature, pressure, etc.

Belden Manufacturing Company, Chicago, Ill., maker of wire and cables, is announcing a new policy regarding spools for fine magnet wire. Heretofore a small credit has been allowed for their return—usually less than one-half the cost. The result has been a decided wastage of spools, which the customers have found unprofitable to return. This has meant a heavy annual spool bill to the manufacturer, which consequently has affected the price of magnet wire. Therefore the company has revised its price of magnet wire, making reductions therein where permitted by eliminating the spool loss from the wire cost. The effort is to have purchasers return wire spools as readily as they do wire reels, thus receiving credit therefor and materially reducing the cost of this item of manufacture.

Edison Storage Battery Company, Orange, N. J., has issued a new bulletin on the use of the Edison nickel-iron-alkaline battery in commercial vehicle service. After enumerating some points of superiority of the electric wagon in delivery service and the effect that the Edison battery has had in increasing its simplicity, durability and reliability and in reducing the cost of maintenance, repairs, and the labor attending them, the book briefly describes the construction of the Edison cell and gives examples of some remarkable characteristics. The bulletin is well illustrated with pictures of trucks from practically all of the manufacturers and in a great variety of services. Several views are also shown of the effect of accidents through which the batteries have passed without serious injury. A striking feature of the book is an extract from an address by Dr. Steinmetz. The book is well printed and will undoubtedly prove of assistance to central stations, electric garages, dealers and others, in promoting the sale of the electric commercial vehicle.

The Youngstown Sheet & Tube Company, Youngstown, O., announces a profit-sharing distribution on five per cent of the earnings of its employees eligible under the company's profit-sharing plan during the year 1915. The amount distributed will be approximately $350,000. About 9,000 men are affected. This profit-sharing plan, which is the only cash distribution system in effect by any steel corporation in the Youngstown district, has been in operation since 1909, being one of the first established in this country. In 1910 the first distribution of five per cent was paid. In 1913 the distribution was five per cent, and in 1914 it was three per cent. The distribution authorized for 1915 will be made as soon as the clerical work can be completed, probably the second pay period in March. This distribution is of special interest because the company has appropriated in the past year about $8,000,000 for extensions, some of which are now approaching completion. Included in these are new bar mills, a coke-oven battery of 204 Koppers ovens, an additional blast furnace, plant office building, emergency hospitals, laboratories building, additional open-hearth furnaces, and other mill extensions which will increase the annual output of steel about 300,000 tons.

Cutler-Hammer Christmas Party.—Twenty-five hundred people, representing 1,400 employees of the Cutler-Hammer Manufacturing Company, and their families, were entertained at a Christmas Party, at Milwaukee, Wis., on December 22, by the Cutler-Hammer Entertainment Committee, composed entirely of employees of the company. Many large manufacturing concerns have in the past provided summer outings and winter entertainments, but in practically every instance the financial support has come from the employers. Cutler-Hammer outings and entertainments are engineered and financed entirely by a committee of employees. An entertainment given early in November was so successful financially as to make it possible for the Entertainment Committee to provide a Christmas Party at no cost to employees and their families. Entertainment for old and young was the aim of the committee when preparing the Christmas Party. Miss Clementine Malek, a well known soprano, sang several songs and was followed by the Rev. Wm. T. Dorward, an entertaining after-dinner speaker. Fifteen hundred people enjoyed dancing to the music of an employees' orchestra; 600 pounds of candy and numberless small gifts were distributed to 1,000 children present. Cutler-Hammer outings and entertainments have been strong forces in unifying the workers and promoting co-operation with the employers. While the employees have been in actual charge, the officers of the company have always been interested in making these events successful.

CURRENT ELECTRICAL NEWS

ATLANTIC STATES.

BATH, ME.—Negotiations have been completed by Harvey D. Eaton, president of Waterville, and Walter S. Wyman, of Augusta, treasurer and general manager of the Central Maine Power Company, and Hon. A. H. Shaw, president of the Penobscot Bay Electric Company, and Greenville Light and Power Company, for the consolidation of the above companies, subject to the approval of the Public Utilities Commission, and papers were signed to this effect. The Greenville Light and Power Company was organized originally under the general law in 1904, with several amendments by the legislature since. Besides its hydraulic plant at Wilson Pond it has acquired the properties of the Dover & Foxcroft Light and Heat Company, the Sangerville Improvement Company, and built a water system at Greenville, taking its water on Little Squaw Mountain, six miles away. This system of waterworks, however, was not included in this deal.

MIDVALE, N. J.—Members of the Pompton township committee do not expect any objections to the franchise ordinance being granted to Butler, permitting that municipality to furnish commercial light in Bloomingdale.

NORTH CENTRAL STATES.

CHRISTIANBURG, O.—The Christianburg Light, Heat and Power Company has been incorporated with a capital stock of $5,000, to distribute current in this town from the lines of the Springfield, Troy & Piqua Traction Company. Fred J. Green, manager of the traction company, is one of the incorporators. L.

CINCINNATI, O.—It has been definitely announced, following a meeting in New York of the board of directors of the Union Gas and Electric Company, that the company will construct in the immediate future the proposed central power station mentioned some time ago. The site will be in or near Cincinnati, on the Ohio River, and the plant will be adequate for all purposes for many years to come, according to the plan now considered. L.

CINCINNATI, O.—The Norwood Board of Education will receive proposals until January 24, at 12 o'clock, for the construction of a school building, plans for which have been prepared by Bauscmith & Drainie, architects. Electrical equipment is included.

JACKSONVILLE, ILL.—Electrification of the south end pumping station of the municipal waterworks is being discussed by the city council.

HUDSON, MICH.—A new company called the Southern Michigan Light and Power Company has been organized, taking over the property of the Hudson Light and Power Company and Morenci & Fayette Light Company. The plan of the company is to extend its power transmission line to other towns and villages in southern Michigan and northern Ohio. George F. Avis is president. The principal offices of the company will be located in Hudson.

MARSHALL, WIS.—The Marshall Electric Light and Power Company, which will furnish electric light and power in the village of Marshall, has filed articles of incorporation at Madison. The company is capitalized at $1,000 and the incorporators are R. J. Russ and Joseph O. Meyers, of Reeseville, and G. C. Schmitt, of Watertown.

MONTICELLO, WIS.—For improvements to municipal light system $12,000 in bonds have been voted. Address city clerk.

HALLOCK, MINN.—Greenbush and Hallock have voted to issue bonds for electric lighting plants. Address town clerk.

LITCHFIELD, MINN.—The Municipal Electric Light Company will erect generating plant in connection with the present lighting plant.

ROCHESTER, MINN.—February 1 an election will be held to decide the question of issuing $360,000 Zumbro River electric bonds. Address Alderman Enke.

KANAWHA, IOWA.—An election will be held to decide the question of issuing $13,000 municipal light bonds. Address F. L. Bush, mayor.

BEATRICE, NEB.—The council plans to improve the electric light system. Address Mayor Mayer.

CIRCLEVILLE, KANS. — Bonds have been voted for the erection of an electic lighting plant. Address city clerk.

SOUTH CENTRAL STATES.

CHATTANOOGA, TENN.—Various light and water systems owned by the syndicate controlled by G. B. Adams and associates, of this city, which are located throughout middle and east Tennessee, will be consolidated under the general name of the Tennessee Water Company. Application for a charter for the company has been filed. The capital stock will be $600,000, and the incorporators are George B. Adams, J. L. Foust, C. O. Lindsay, George W. Erwin and R. B. Cooke.

DANDRIDGE, TENN.—By decree of chancery court, at November term, the clerk and master sold at public auction on a credit of one and two years' time, the Dandridge light and power plant here. John A. Walker bought the power plant and its equipment. It is thought the sale may be confirmed within the next month, in which event the plant may be run by water power from the Walker mill just east of town, and day service established.

MOULTON, ALA.—The Moulton waterworks, owned by O. C. Prince, is considering the construction of an electric lighting plant.

NEW DECATUR, ALA.—The city is planning the installation of a lighting plant.

SUMNER, MISS.—The Southern Electric Service Company, a reorganization of the Sumner Electric Company, and of which A. S. Carl, of Winona, is manager, will change from direct current to alternating current at 2,300 volts. It will construct a six-mile transmission line to Tutwiller, Miss., and a two-mile line to Wells, Miss.

MIAMI, OKLA.—The Empire District Electric Company has been organized here with a capital stock of $30,000. George W. Beck, Jr., is interested. D.

BEEVILLE, TEX. — It is planned by the Texas Southern Electric Company to install a new generator and other equipment in its electric light plant here. F. C. Greer is local manager. D.

COLUMBUS, TEX.—Abe Stiener and associates have purchased the local electric light plant. They will install new machinery and extend the lighting system to Glidden. D.

WESTERN STATES.

TROY, IDAHO.—The county board has granted the request of A. V. Dunkle, of Kendrick, for a franchise to utilize the public highways for the purpose of installing an electric light and power transmission line between Kendrick and Troy.

PHOENIX, ARIZ.—Sealed bids will be received by the city manager up to February 3 for furnishing all material for making extensions to the underground street lighting system.

GALLUP, N. M.—C. J. Price, manager of the Gallup Electric Light Company, is making arrangements for the enlargement of the local plant by the installation of larger and more adequate machinery.

NEWPORT, CAL.—At a recent meeting of the City Trustees the report of the lighting committee was heard, recommending the completion of the city's lighting system and advising temporary lights placed on Ocean Front, from Nineteenth Street to the pier, and in various other places.

ORANGE, CAL.—A resolution of intention has been passed by the City Trustees relative to the formation of the proposed lighting district covering the main business section of the city.

TACOMA, WASH.—The Puget Sound Traction, Light and Power Company is preparing to extend its lines to Ruston to furnish electric power, providing a franchise can be secured.

NEW PUBLICATION.

ST. LOUIS ENGINEERS' CLUB.—The *Journal* of the Association of Engineering Societies has been discontinued owing to the disbanding of the Association. The Engineers' Club of St. Louis, which constituted about 70 per cent of the membership of the Association, has decided to begin the publication of a bi-monthly, which will be known as the *Journal of the Engineers' Club of St. Louis.* The subscription price is $2.00.

FOREIGN TRADE OPPORTUNITIES.

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 19,605. ELECTRICAL GOODS.—A firm in the United States writes that a firm in Spain desires to obtain exclusive agencies for American electrical goods and hardware. References will be given.

NO. 19,609. ELECTRIC PASSENGER ELEVATORS, ELECTRIC INSTALLATIONS, ETC.—A commercial organization in the United States writes that the manager of a large firm in Peru desires to communicate with manufacturers of electric passenger elevators; electric installations for cities; electric material, such as copper wire and insulators for installations. Catalogs, quotations, terms, etc., are desired.

NO. 19,628. ELECTRIC LAMPS, PUMPS AND APPARATUS.—A report from an American consular officer states that a man in Spain desires to act as agent for firms manufacturing electrical goods, such as electric lamps of one-half-watt efficiency from 50 to 500 candlepower, for voltages of 110 and 220. It is stated that the inquirer can sell from 8,000 to 10,000 per month. Prices and terms are also requested for metal-filament bulbs from 10 to 50 candlepower, for which there is a sale of about 25,000 per month. An agency is also desired for electric pumps and apparatus. Catalogs and correspondence should be in Spanish, but prices, if possible, should be in francs. References are given.

FINANCIAL NOTES.

There has been added to the regular list of the Philadelphia Stock Exchange $2,560,000 additional common stock and $1,500,000 additional preferred stock of the American Railways Company of New Jersey issued in payments of the subscription of the American Railways Company of New Jersey made February 12, 1913, to a like amount of preferred and common stock of the American Railways Company of Delaware.

Dividends.

	Term	Rate	Payable
Bell Tel. of Pa	Q	1.5 %	Jan. 15
Edison Elec. Illum., Brockton	Q	$2.00	Feb. 1
Ill. No. Util., pf.	Q	1.5 %	Feb. 1
Iowa Ry. & Lt., pf.	Q	1.75%	Dec. 31
Monongahela Val. Trac., com.	Q	1 %	Jan. 15
New England Co., 2d pf.	S	2 %	Jan. 15
New England Pw., pf.	Q	1.5 %	Jan. 15
Penn. Cen. Lt. & Pw., pf.	—	1 %	Jan. 3
Pub. Serv. of No. Ill., com.	Q	1.25%	Feb. 1
Pub. Serv. of No. Ill., pf.	Q	1.5 %	Feb. 1
United Gas & Elec., pf.	S	2.5 %	Jan. 15

NEW INCORPORATIONS.

NEW YORK, N. Y.—Independent Electric Lighting Corporation, Inc. Capital, $5,000. Incorporators: Helen White, City Island, N. Y.; Alexander Werner, Harry E. Diamond, New York, N. Y.

NEW YORK, N. Y.—Light and Power Meter Corporation. To manufacture meters and other electrical equipment. Capital, $500. Incorporators: Henry Wetherhon, Robert C. Lipman, New York, N. Y.; William J. Spatckhaver, Long Island City, N. Y.

PERSONAL MENTION.

MR. C. E. FAHRNEY, manager of the Ottumwa Railway & Light Company, Ottumwa, Ia., has been appointed a member of the Commercial Association Committee, which has in charge the promotion of a county fair for 1916.

MR. W. K. VANDERPOEL, formerly superintendent of distribution of the Newark district of the Public Service Electric Company, has been promoted to the position of general superintendent of distribution for the state. His position has been open ever since Farley Osgood was made assistant general manager.

MR. O. S. BEYER, JR., of Horton, Kans., has been appointed first assistant in the Engineering Experiment Station in the Department of Railway Engineering of the University of Illinois. Mr. Beyer was born in Woodridge, N. J., in 1886, and graduated from Stevens Institute of Technology in 1907 with the degree of Mechanical Engineer. He later did advanced work in economics and railway freight rates at the University of Pennsylvania and also at the University of New York.

MR. TRYGVE D. YENSEN, first assistant in the Engineering Experiment Station in the Department of Electrical Engineering of the University of Illinois, has recently been made the recipient of an unusual expression of appreciation from the officers of that institution. In response to the recommendation of the dean of the College of Engineering, seconded by all of the heads of departments of the college, the trustees, in recognition of Mr. Yensen's significant service in the development of engineering research, have voted that he be promoted, effective January 1, 1916, to be research assistant professor of electrical engineering. It is unusual for the trustees to make promotions in the middle of the college year, and they were constrained to such action in the case of Mr. Yensen because of his success in the development of alloys of iron possessing remarkable electrical properties.

OBITUARY.

MR. THOMAS WALLACE, managing director of the Waclark Wire Company, and a pioneer in the manufacture of copper wire, died on New Year's Day at his home, 346 West Seventy-first Street, New York City. Mr. Wallace would have been 89 years old had he lived until February 7. He was born in Manchester, England, and came to this country when he was five years old. With his father and brothers Mr. Wallace established at Ansonia, Conn., in 1849, the firm of Wallace & Sons, which was the first concern to make copper wire in this country. Mr. Wallace was the first manufacturer to introduce continuous fine-wire machinery for drawing fine brass and copper wire, a process which revolutionized the industry. For the last fifteen years Mr. Wallace was managing director of the Waclark Wire Company. In 1856 he married Ellen Bryant of Springfield, Mass. With four sons and four daughters she survives him.

MR. CALVIN G. GOODRICH, president of the Minneapolis Street Railway Company, and of the Duluth-Superior Street Railway Company, died at Duluth, Minn., of bronchial-pneumonia at his home on December 21, after an illness of 10 days. Mr. Goodrich was born at Oxford, O., 59 years ago. A widow and son survive him. The Duluth *Herald* says of him: "Mr. Goodrich also was president of the Twin City Rapid Transit Company, the holding company of both the Minneapolis and St. Paul Street Railway Companies.

"At the time of the death of Thomas Lowry, a few years ago, the man who made the Twin City Rapid Transit Company, it was feared his successor could not be found. Mr. Goodrich, then vice-president, was advanced to the presidency and has amply proved the wisdom of the promotion. As a hard worker he was famous.

"C. G. Goodrich, vice-president of the Twin City Rapid Transit Company, for fourteen or fifteen years has been the head and front of the street railway system of the two cities. What he said was the last word. There was none to dispute it. Only Mr. Lowry could have overruled him, but he never did. Even in the subtleties of corporation finance, and there have been anxious days in Rapid Transit affairs when a financial genius was needed to solve perplexing questions and to solve them at once, and to stay solved, it was Mr. Goodrich who solved them. His fame as a street railway manager was recognized and appreciated as thoroughly in Wall Street as it was at home. Some of that Wall Street reputation was based on the fact that back of Goodrich was Lowry, but the glory of Goodrich is not dimmed thereby.

"But, aside from any ability as a man of weight in financial centers, Mr. Goodrich was known as 'the' street railway man. If the street railway system of the Twin Cities is good, and the world knows it is, Mr. Goodrich made it so. If improvements have been made from year to year, Mr. Goodrich made them possible. If improvements have not come as rapidly as some people have wished, if city councils have failed to carry to successful conclusions street railway legislation that was demanded, wisely or unwisely, or if city attorneys have apparently laid down on legal roads that looked per-

CLOSING BID PRICES FOR ELECTRICAL SECURITIES IN THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Jan. 3	Dec. 27
American Tel. & Tel. (New York)	*127¼	128⅞
Commonwealth Edison (Chicago)	144	141
Edison Electric Illuminating (Boston)	246¾	244
Electric Storage Battery, common (Philadelphia)	66½	66
Electric Storage Battery, preferred (Philadelphia)	66½	66
General Electric (New York)	174½	173
Kings County Electric (New York)	126	126
Massachusetts Electric, common (Boston)	5½	5½
Massachusetts Electric, preferred stamped (Boston)	34	34
National Carbon, common (Chicago)	165	165
National Carbon, preferred (Chicago)	121	121
New England Telephone (Boston)	132	132¼
Philadelphia Electric (Philadelphia)	28⅝	28¾
Postal Telegraph and Cables, common (New York)	78½	78½
Postal Telegraph and Cables, preferred (New York)	65¼	65
Western Union (New York)	87¾	86½
Westinghouse, preferred (New York)	*80	78
Westinghouse, common (New York)	*69¾	68⅞

*Ex. dividend.

fectly clear and plain, then Goodrich, only Goodrich, was blamed.

"Busy as he was with Twin City matters, Mr. Goodrich was also president of the Duluth-Superior street-railway system, and he was known to Head of the Lakes business men almost as well as to those of Minneapolis and St. Paul. He also had interests in other Twin City corporations and took an active interest in their management.

"Mr. Goodrich was the soul of generosity. It is doubtful whether any worthy charity was refused by him, and he contributed generously to any Twin City enterprise that was in need of support or backing. He was one of the guarantors of the Minneapolis Symphony Orchestra, and was on the side of every worthy cause that made for the ethical advancement of the city. He was too busy for fads. He formerly had one of the best stables in either city, but of late years he rather transferred his allegiance to automobiles."

DATES AHEAD.

Western Society of Engineers. Annual meeting, Hotel Sherman, Chicago, Ill., January 12. Secretary, E. N. Layfield, Monadnock Block, Chicago, Ill.

Northern White Cedar Association. Annual meeting, Hotel Radisson, Minneapolis, Minn., January 13 and 14. Secretary, R. N. Boucher, 743 Lumber Exchange, Minneapolis, Minn.

American Institute of Chemical Engineers. Winter meeting, Baltimore, Md., January 12-15. Secretary, J. C. Olson, Cooper Union, New York, N. Y.

Electrical Contractors' Association of Wisconsin. Annual convention, Hotel Wisconsin, Milwaukee, January 17-19. Secretary, Albert Petermann, 626 Lloyd Street, Milwaukee, Wis.

Western Association of Electrical Inspectors. Eleventh annual meeting, Hotel Sherman, Chicago, January 25-27. Secretary, W. S. Boyd, 175 West Jackson Boulevard, Chicago, Ill.

American Electric Railway Association. Midyear meeting, Congress Hotel, Chicago, Ill., February 4. Secretary, E. R. Burritt, 8 West Fortieth Street, New York City.

American Institute of Electrical Engineers. Midwinter convention, New York City, February 8 and 9. Secretary, F. L. Hutchinson, 33 West Thirty-ninth Street, New York City.

Illuminating Engineering Society. Midwinter convention, New York City, February 10 and 11. Assistant secretary, Joseph Langan, 29 West Thirty-ninth Street, New York City.

New Mexico Electrical Association. Annual convention, Albuquerque, N. M., February 14-16. Secretary, E. A. Thiele, Roswell, N. M.

New England Section, National Electric Light Association. Question-Box convention, Boston, Mass., March 8 and 9. Secretary, Miss O. A. Bursiel, 149 Tremont Street, Boston, Mass.

Wisconsin Electrical Association. Annual convention, Hotel Pfister, Milwaukee, Wis., March 16 and 17. Secretary, George Allison, First National Bank Bldg., Milwaukee, Wis.

Record of Electrical Patents

Issued by the United States Patent Office, December 28, 1915

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,165,383. Elevator-Indicator System. F. A. Boedtcher, Bergenfield, N. J. Annunciator on car operated by floor push-buttons.

1,165,385. Trolley-Wire Pick-Up. G. H. Bolus, assignor to Ohio Brass Co., Mansfield, O. Clamp with insulated handle for picking up electric conductors.

1,165,412. System of Aeroplane-Signaling. H. M. Horton, New York, N. Y. Radio apparatus mounted on aeroplane.

1,165,418. Controlling Electric-Generator Prime Movers. T. H. Kerr, assignor to W. Snee and J. A. Snee, Jr., West Elizabeth, Pa. Wind-wheel-driven generator and storage-battery system.

1,165,420. Municipal-Service Post. O. D. Kleinsteuber, assignor to A. L. Doelger, Milwaukee, Wis. Street post for supporting fire alarm, telephone, etc.

1,165,427. Protector for Pipes or Conduit Units. P. McElroy, assignor to Enameled Metals Co., Sharpsburg, Pa. Conduit-end threads protected during shipment.

1,165,436. Automatic Door-Releasing Apparatus. L. M. Mochau, East Hartford, Conn. Door provided with push for electrically operating latch.

1,165,447. Switch-Controller System. F. N. Reeves and A. E. Lundell, assignors to Western Electric Co., New York, N. Y. For telephone system; primary switch operating singly on number of secondary switches is locked if two of latter are simultaneously operated.

1,165,451. Electrical Heating Element. E. H. Ruckle, assignor to Hughes Electric Heating Co., Chicago, Ill. Avoids concentration of heat at center.

1,165,454. Apparatus for Receiving and Strengthening Electric Oscillations. J. Schiessler, Baden, Austria-Hungary. Receiving and relaying means including electric arcs having oscillating electrodes.

1,165,479. Electric Switch. A. R. Wittwer, Sabetha, Kans. Details of switch having contact bar operated by rotary cam element.

1,165,485. Electrocuting Device. J. T. Adams, Vernonia, Ore. Designed to be used as a floor mat.

1,165,487. Target. E. B. Badcock, London, England. For use with moving-picture apparatus.

1,165,492. Dual Ignition System for Internal-Combustion Motors. E. A. Briggs, Hopewell, N. J., assignor of one-half to F. Pettit. Combination of high and low-tension magnetos and battery.

1,165,495. Machine for Covering Wire, Cord, Elastic, and the Like. E. W. Cooper, Coventry, England. For braiding cover on wires, etc.

1,165,519. Spring Binding-Post. D. K. Kuskin, assignor to American Ever Ready Co., New York, N. Y. Has spring grip for wire end.

1,165,530. Conduit for Electric Wires. E. Mueller, Staten Island, and W. R. McKenney, New York, N. Y. Wire molding having number of conduits, formed from single sheet of metal.

1,165,536. Match-Machine. M. Paridon, assignor to Diamond Match Co., Chicago, Ill. Electric motor driving splint carrier and composition roller controlled by fluid piston for adjusting carrier.

1,165,540. Signal-Actuating Mechanism. H. P. Ryner, assignor to Hoeschen Mfg. Co., Omaha, Nebr. Spring motor for operating signals is automatically wound by electromagnet.

1,165,542. Electric Door-Lock. O. B. Schnerre, Galena, Ill. Electrically operated switch lock.

1,165,553. Electrical Connecting Socket. J. C. Stearns, Worcester, Mass. Has a bendable tongue for securing the pin in the notch in a bayonet joint.

1,165,558. Method of Producing Electromagnetic Coils. C. H. Thordarson, Chicago, Ill. Flat wire coils formed by applying insulation to metal sheet and cutting and winding strips therefrom.

1,165,562. Suction Machine. J. Wynn, Jr., assignor to Climax Mfg. Co., Cleveland, O. Driven by split-phase induction motor.

1,165,563. Electrical Fuse. H. W. Young, Chicago, Ill. Inner fuse-carrying tube for cartridge fuse has frangible head supporting one end of fuse which gives way when fuse is secured to cartridge cap.

1,165,572. Junction Box and Switch. F. A. Culver, Worcester, Mass. Busbar connection plate for automobile lighting circuits.

1,165,581. Automatic Locking and Unlocking of Railway-Carriage Doors. M. Evans, Llanelly, Wales. Lever mechanism operated by solenoid from axle-driven generator.

1,165,592. Centrifugally Controlled Coasting-Indicating Device for Cars or Trains. W. A. Hall and C. W. Hall, assignors to Railway Improvement Co., New York, N. Y. Circuit of indicator is closed centrifugally when car is in motion and opened by application of propelling power.

1,165,595. Trolley Guard. A. P. Hawkins, Newport News, Va. Details of rope-operated device.

1,165,596. Magnetoelectric Machine. O. Heins, assignor to Bosch Magneto Co., New York, N. Y. Provision for securing proper interruption in reversible machine.

1,165,601. Electrical Ignition Device. G. Honold, Stuttgart, Germany. Adjustable induction coil.

1,165,602. Automatic Replacing Device for Circuit-Breakers. G. S. Hoover, Tippecanoe, O., assignor of one-sixth each to F. M. Hogue, H. G. Bonnell, and J. B. Gallaher. Automatically operated switch mechanism controlling motor for closing breaker.

1,165,610. Timing Device for Explosion Engines. F. H. Lansdell, Atlanta, Ga. Details of structure for multi-cylinder engines.

1,165,619. Electrode for Projection Apparatus. M. H. Moffett, assignor to National Carbon Co., Cleveland, O. Has insulating coating at one end preventing making circuit before it is properly adjusted.

1,165,639. Electropneumatic Brake Apparatus. W. V. Turner, assignor to Westinghouse Air Brake Co., Wilmerding, Pa. Electrically controlled means for venting air from brake pipe to brake cylinder.

1,165,663. Controller. H. E. Goldberg, Chicago, Ill., assignor of one-half to R. P. Lamont, Chicago, Ill. Electromagnetically operated mechanism controlled by sheet having conducting characters.

1,165,683. Electric Switch Mechanism. J. B. Lee, Savannah, Ga. Means for driving two switch mechanisms in desired time relations.

1,165,690. Telephone-Exchange Trunking System. T. G. Martin, assignor to Automatic Electric Co., Chicago, Ill. Arrangement of two-way trunk between subscriber's line switch and manual board.

1,165,709. Automatic Telephone System. W. T. Powell, assignor to Automatic Electric Co. Special calling trunk equipment.

1,165,712. Fly-Catcher. F. Rea, San Francisco, Cal., assignor of one-half to A. M. Sheakley. Compact, portable suction-fan device. (See cut on next page.)

1,165,728. Telephone Trunking System. J. A. Taggart, assignor to Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y. Arrangement of selector switches, link circuits, etc., for connecting between operators' stations.

1,165,745. Electrical Measuring Instrument. A. O. Bencke, Foxboro, Mass. Structure of magnets in indicating instrument.

1,165,747. Coupling for Conduit Rods. E. L. Brockway, Glenside, Pa. For joining sections of drawing-in rods.

1,165,756. Cable Terminal. F. B. Cook, assignor to Frank B. Cook Co., Chicago, Ill. Structure of head comprising fanning strips for connecting in wires.

1,165,784. Electrically Propelled Vehicle. J. M. Klingelsmith, assignor to Klingelsmith Electric Truck Co., Chicago, Ill. Special structure of battery support and compartment facilitating handling and ventilation.

1,165,788. Means for Regulating the Speed of Electric Motors. F. G. Liljenroth, Vesteras, Sweden. Speed of direct-current motor regulated by varying generator field in response to voltage of generator driven by motor.

1,165,814. Electrically Operated Pulley Block. C. Tadey, assignor to Deutsche Maschinenfabrik Aktiengesellschaft, Duisburg, Germany. Hoisting drum geared to motor within it.

1,165,843. Removable-Unit Oil Switch. G. A. Burnham, assignor to General Electric Co., Schenectady, N. Y. Switch and oil tank form unit readily removable and replaceable.

1,165,844. Protecting Means for Electrical Distributing Systems. G. A. Burn-

ham, assignor to General Electric Co. Arrangement of series transformers for operating circuit-breakers.

1,165,850. Frequency Meter for Measuring Electrical Current. L. Cohen, assignor to S. M. Kinter, Pittsburgh, Pa., and H. M. Barrett, Bloomfield, N. J. Hot-wire ammeter with composite scale and co-operating pointers indicating current and frequency.

1,165,853. Signal-Lamp Control for Vehicles. C. W. Davis, Chicago, Ill. Manner of controlling pilot and tail lights.

1,165,862. Apparatus for Wireless Signaling. R. A. Fessenden, assignor to S. M. Kinter, Pittsburgh, Pa., and H. M. Barrett, Bloomfield, N. J. High-frequency inductor generator.

1,165,903. Playing Apparatus for Musical Instruments. W. C. Reed, assignor to Telectric Co., Pittsfield, Mass. Expression-controlling circuits controlled by music sheet and also manually.

1,165,904. Electromagnet. W. C. Reed, assignor to Telectric Co. Particular structure of pole pieces and armature for use in musical instruments.

1,165,916. Safety Elevator Device. I. Spiradek, S. Kalisz and W. Wilkosz, Chicago, Ill. Special structure of switch.

1,165,921. Apparatus for Sterilizing Milk. M. von Recklinghausen, assignor to the R. U. V. Co., New York, N. Y. Quartz-tube sterilization with electric alarm.

1,165,928. Power-Factor Regulator. F. H. Winter, assignor to General Electric Co. Automatically regulated rotary condenser.

1,165,935. Controlling Device. J. M. Anderson, assignor to Albert & J. M. Anderson Mfg. Co., Boston, Mass. Special gearing for time-limit circuit-breaker.

1,165,943. Electrically Controlled Lock. L. Cadenel, Paris, France. Electromagnetically operated bolt.

1,165,944. Reflector Arm for Electric Lamps. M. Chalier, Paris, France. For music stands.

1,165,949. Direction-Indicator for Motor Vehicles. S. F. Douglas, Prairie du Rocher, Ill., assignor to Vehicle Signal Co. Arrows on indicating plate operated by solenoids.

1,165,958. Heating System for Constant-Temperature Baths. T. B. Freas, assignor to V. Weber & Co., Chicago, Ill. Temperature of electrically heated chamber controlled by thermostat.

1,165,970. Signaling Glove. E. Harris, Santa Barbara, Cal. Lamp and battery on glove controlled by contacts on fingers.

1,165,983. Electrolytic Rectifier. A. L. Blanc, assignor to Gurney Electric Elevator Co., Honesdale, Pa. Aluminum cup containing electrolyte placed in bath of another electrolyte and pair of plates of other material are placed in the respective electrolytes.

1,166,003. Portable Electric Lamp. A. C. Recker, assignor to Waterbury Mfg. Co., Waterbury, Conn. Battery structure mounted in holder similar to candlestick with switch in handle. (See cut.)

1,166,008. Spinning or Twisting Machine With Separately and Electrically Driven Fliers. H. Schneider, Neusalz-on-the-Oder, Germany. Bearing for flier formed by casing of its motor.

1,166,030. Controlling Mechanism for Electric-Light Signs. W. A. Willover, C. W. Angell and J. W. Gallaspie, Lima, O. Contacts operated by perforated sheet.

1,166,034. Electrical Apparatus for Transmitting Signals. W. Akemann, assignor to Fried. Krupp Aktiengesellschaft, Essen-on-the Ruhr, Germany. Reading and setting devices in a receiver.

1,166,055. Electric Switch. J. A. Keyes, New York, N. Y. Special push-operated, quick-break structure.

1,166,081. Thermostat. J. H. Royall, Houston, Tex., assignor of 24/100 to G. W. E. Merewether, and 24/100 to J. R. Maxfield. Circuit closure effected by slight movement of thermal elements.

1,166,087. Electric Coupling. A. Schmidt, assignor to Champion Ignition Co., Flint, Mich. Resilient clip for securing conductor terminal to spark plug.

1,166,090. Indicating System for Telephone Pay Station. A. J. Seymour, Minneapolis, Minn. For indicating at exchange deposit of coin at station.

1,166,094. Hair-Clipper. M. Tanaka, New York, N. Y. Electric-motor-driven.

1,166,095. Electric Heating Element. H. E. Van Doren, South Bend, Ind. Method of forming heating plates.

1,166,101 and 1,166,102. Storage Battery. T. A. Willard, assignor to Willard Storage Battery Co., Cleveland, O. First patent: Structure of jar cover. Second patent: Structure of vent plug.

1,166,108. Spark Plug. C. K. Austin, Woodstock, Ill. Both electrodes are mounted in insulating core.

1,166,114. Wire-Clamping Device. J. Cuthbert, Chicago, Ill. Wire coiling and binding clamp.

1,166,115. Indicating Device for Phonography and its Application. W. de Pezzer, Paris, France. Method of preparing a record so that it may be operated in synchronism with the band of a rythmic indicator.

1,166,129. Terminal for Contact or Spark Devices. P. R. Heyl, assignor to Commercial Research Co., New York, N. Y. Comprises palladium and silver.

1,166,134. Motor Bearing. F. R. Kunkel, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Lubrication, etc., of vertical shaft.

1,166,149. Binding Device for Panelboards. R. H. Olley, assignor to Crouse-Hinds Co., Syracuse, N. Y. Structural details.

1,166,150. Voltage - Regulator. A. H. Olmsted, Altrincham, England. Vibratory-contact field regulation.

1,166,152. Telephone Receiver. T. Rhodus,

No. 1,165,712.—Fly Catcher.

Chicago, Ill., assignor to Magniphone Co. Details of magnet in flat structure.

1,166,154. Sadiron. E. E. Rose, assignor to Westinghouse Electric & Mfg. Co. Relates to the plug holder.

1,166,157. Liquid Rheostat. K. A. Simmon and A. J. Hall, assignors to Westinghouse Electric & Mfg. Co. Relates to the liquid supply.

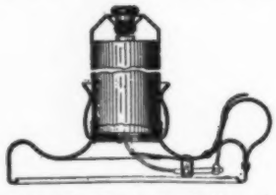
1,166,159. Method of Measuring Capacity and Power-Factor. P. Thomas, assignor to Westinghouse Electric & Mfg. Co. Employs Wheatstone bridge.

1,166,161. Brush-Holder. M. Walker, assignor to Westinghouse Electric & Mfg. Co. Special spring pressure and holding device for number of bushes side by side.

1,166,186. Starting Means for Vapor Electric Devices. F. Conrad, assignor to Westinghouse Electric & Mfg. Co. Structure and mounting of movable electrode.

1,166,189. Device for Removing and Replacing Electric Lamps. A. W. Darby, Holyoke, Mass. Pole fitting for gripping incandescent lamps.

1,166,194. Automatic Electric Coupling Mechanism for Car-Line Circuits. J. S. Doyle and F. Hedley, assignors to West-



No. 1,166,003.—Portable Battery Lamp.

inghouse Air Brake Co., Pittsburgh, Pa. Casing containing coupling mechanism, has cover opened and mechanism thrown into operative position by bringing of cars together.

1,166,196. Vapor Rectifier. G. M. Eaton, assignor to Westinghouse Electric & Mfg. Co. Insulating support for an electrode shield.

1,166,217. Seal. R. P. Jackson, assignor to Westinghouse Electric & Mfg. Co. Manner of sealing electrode into metal container in vapor electric device.

1,166,227. Telpherage System. J. Lamb, Canton, Ill. Structure of electric trolley conductor, trolley, etc.

1,166,229. Regulator. H. A. Laycock, assignor to General Electric Co. Vibratory-contact, generator-voltage regulator.

1,166,256. Electrode-Holder. J. R. Pratt, Denison, Tex. For holding arc electrode.

1,166,265. Cartridge for Flashlight Apparatus and Lamps. F. C. Schofield, assignor to the Towles-Schofield Co., Alexandria, Va. Has electric ignition.

1,166,270. Window Sign. R. M. Smith, Sioux Falls, S. D. Advertising sign having movable element driven through attraction of motor-driven magnet.

1,166,272. Electric Umbrella. F. W. Smithing, Ontonagon, Mich. Has lamps, battery and controlling push-button in handle.

1,166,331. Method and Apparatus for Safeguarding Navigation. A. G. Davis, assignor to General Electric Co. Presence of ice indicated by thermoelectric devices.

1,166,339. Electromagnetic Switch. J. Eaton, assignor to General Electric Co. Particular contact structure.

1,166,345. Switch Handle. F. P. Gates, assignor to Arrow Electric Co., Hartford, Conn. Manner of securing porcelain handle to switch spindle.

1,166,349. Attachment Plug and Receptacle. G. W. Goodridge, assignor to Bryant Electric Co., Bridgeport, Conn. Details of flush receptacle and co-operating plug.

1,166,366. Sparking Indicator. C. E. Harlan, Watsonville, Cal., assignor of one-half to W. H. Ames. Auxiliary spark gap.

1,166,371. Hanger for Light-Reflecting Bowls. M. Herskovitz, assignor to Peerless Light Co., Chicago, Ill. Manner of engaging bowl and securing lamp sockets thereto.

1,166,385. Spark Plug. D. W. Peck, Syracuse, N. Y. Central electrode in sections with priming channel.

1,166,391, 1,166,392 and 1,166,393. Insulator. L. Steinberger, Brooklyn, N. Y. First patent: Strain insulator. Second patent: Modification of above. Third patent: Petticoat insulator.

1,166,394. Spool-Type Strain Insulator. L. Steinberger. Special structure preventing flow of liquid along walls.

1,166,410. Electrical Instrument. G. W. Cornman, assignor to Brown Instrument Co., Philadelphia, Pa. Relates to coil pivots, counterpoise, etc., in indicating instrument.

1,166,414. Galvanic Cell. M. L. Kaplan, assignor to Beacon Miniature Electric Co., New York, N. Y. Has acid manganous polymanganite as depolarizer.

Patents Expired.

The following United States patents expired on January 3, 1916:

616,879. Electromechanical Gong. C. E. Beach, Binghamton, N. Y.

616,891. Electrolytic Apparatus for Treating Metals and Ores. G. D. Borton, Boston, Mass.

616,906. Electric Furnace. J. A. Deuther, Boston, Mass.

616,953. Telephone Receiver. J. J. Mulconroy, Philadelphia, Pa.

616,956. Electromagnetic Brake. F. C. Newell, Chicago, Ill.

616,978. Storage Battery. F. W. Schneider, Triberg, Germany.

616,979. Means for Cooling Dynamoelectric Machines. G. W. von Siemens and A. W. H. Rotth, Berlin, Germany.

617,002. Means for Producing Battery Electrodes. T. A. Willard, Norwalk, O.

617,003. Tubular Electrode for Storage Batteries. T. A. Willard.

617,004. Storage-Battery Electrode. T. A. Willard.

617,010. Timing Apparatus for Trolley-Railway Systems. H. Garrett, Dallas Tex.

617,024. Electrolytic Reducing and Amalgamating Sluice. J. H. Jory, San Francisco, Cal.

617,067. Helix for Electrical Apparatus. J. T. Williams, New York, N. Y.

617,099. Electromagnetic Apparatus for Actuating Mechanism. S. H. Hoggson, Chicago, Ill.

617,114. Electric Motor. C. R. Meston, St. Louis, Mo.

617,121. Apparatus for Electric Current Supply, etc. E. J. Preston and A. B. Gill, London, England.

617,128. Electric Elevator. A. B. See, N. O. Lindstrom and D. A. Mason, New York, N. Y.

617,139. Electric Block System for Railways. H. Baluss, Jr., Wayne, Mich.

617,145. Telephone Exchange Switch and Signal Apparatus. W. W. Dean, Boston, Mass.

617,165. System of Electrical Distribution. S. Kirlin, Watertown, S. D.

617,170. Combined Lightning Arrester and Fusible Cutout. B. L. Lawton and E. C. Wilcox, Meriden, Conn.

617,187. Means for Generating Electricity from Machinery for Locomotives. H. F. Roach, St. Louis, Mo.

617,192. Electric Propulsion of Vehicles. F. W. Schneider, Triberg, Germany.

617,193. Electric Switch. O. H. Schuck, Philadelphia, Pa.

617,275. Quick-Break Electric Switch. W. F. Bossert and G. L. Holton, Utica, N. Y.

617,287. Circuit-Closer. J. D. Garlock, Palmyra, N. Y.

Reissue 11,706. Electric Buoy. E. W. G. C. Hoffman, Charlottenburg, Germany.